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THE TOOL ENGINEER

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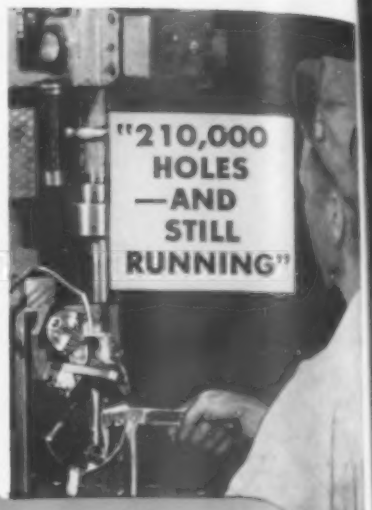
Behind every manufactured product is the tool engineer



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December 1950

Vol. [illegible] No. 6

The Year-End Balance

DECEMBER, along with its colorful holidays, brings us an opportunity to evaluate and weigh our aims, accomplishments and general performance during the year about to permanently close.

And to those of us to whom ASTE is an important part of our lives, it offers an opportunity to consider the past year in terms of whether ASTE has made during the year the forward strides it must continually achieve in order to grow and become stronger.

So let's review 1950 and what it meant to ASTE. We started the year with one of the most important moves ASTE has ever made—the taking over of *The Tool Engineer*. For a long time an aim of the Society, the move was completed at the turn of last year and has met with increasing success.

Our ASTE Industrial Exposition in Philadelphia last April was an unqualified success for ASTE, for exhibitors at the show and for members and guests who attended. Some of the income from the show provided the means for retiring completely ASTE's bonded indebtedness on its headquarters building.

The Tool Engineers Handbook reached an increasingly larger audience during 1950. Sales were considerably in excess of early estimates, and confirmed ASTE's original feeling that such a work was vitally needed by industry.

Technical activities of the Society were heavily stressed during 1950, and several were expanded to a large degree. Our newly-formed research commitee has met to establish an operating procedure and organize for future activities. Technical programs at national meetings have been emphasized greatly, and plans are maturing for our annual meeting in New York next spring, at which the technical program will be by far the largest ever scheduled for an annual meeting.

Further efforts toward an expanded program of technical activities can be seen in the recent Board of Directors' approval of a schedule of regional technical meetings for ASTE. Tentative plans call for about two during next year, and it is felt that individual members will benefit even more from such regional meetings than from the semi-annual meetings they will replace.

Plans for awarding of ASTE scholarships on a national basis emphasize ASTE's feeling on the importance of developing new tool engineering talent. A new technical manual approved by the Board at its October meeting is another manifestation of the Society's concern with encouraging students and young tool engineers.

These have been ASTE's accomplishments during the past year. We have many plans outlined for next year—an important one will be announced next month—and we voice a humble prayer that our hopes will be realized.

H. L. Tigges

President 1950-51

THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second-class matter, November 6, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscription for members, $2.00. Non-members, $6.00. Canada, $6.50; all other foreign countries, $8.00 per year.
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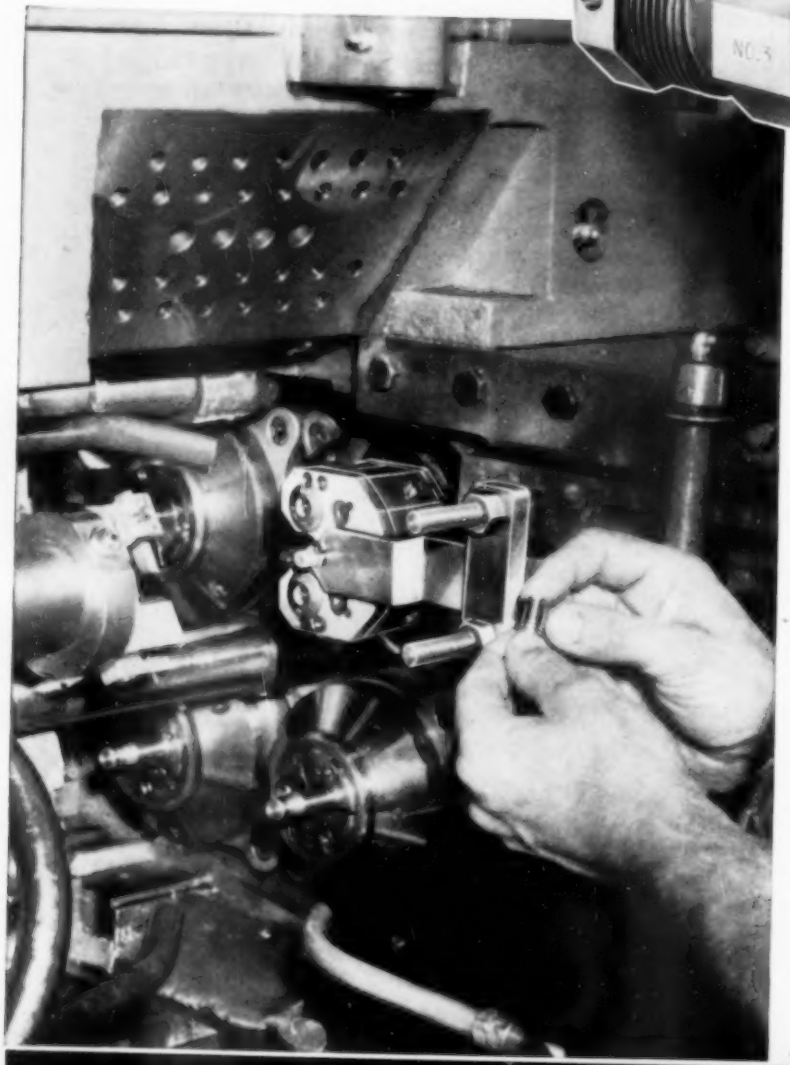
ANNOUNCING

The Model "G" LANROLL Attachment



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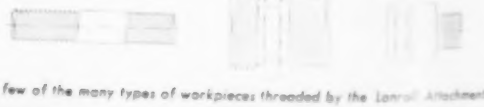

A few of the many types of workpieces threaded by the Lanroll Attachment

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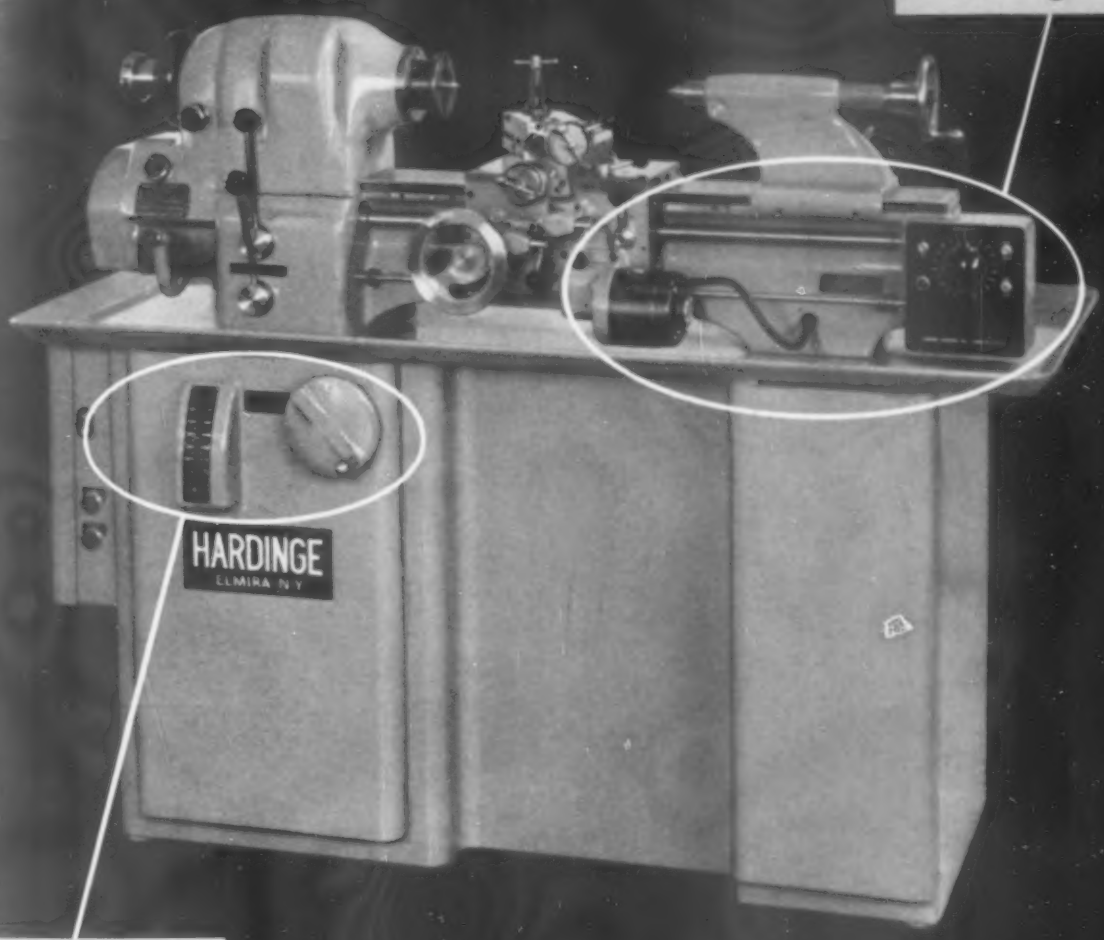

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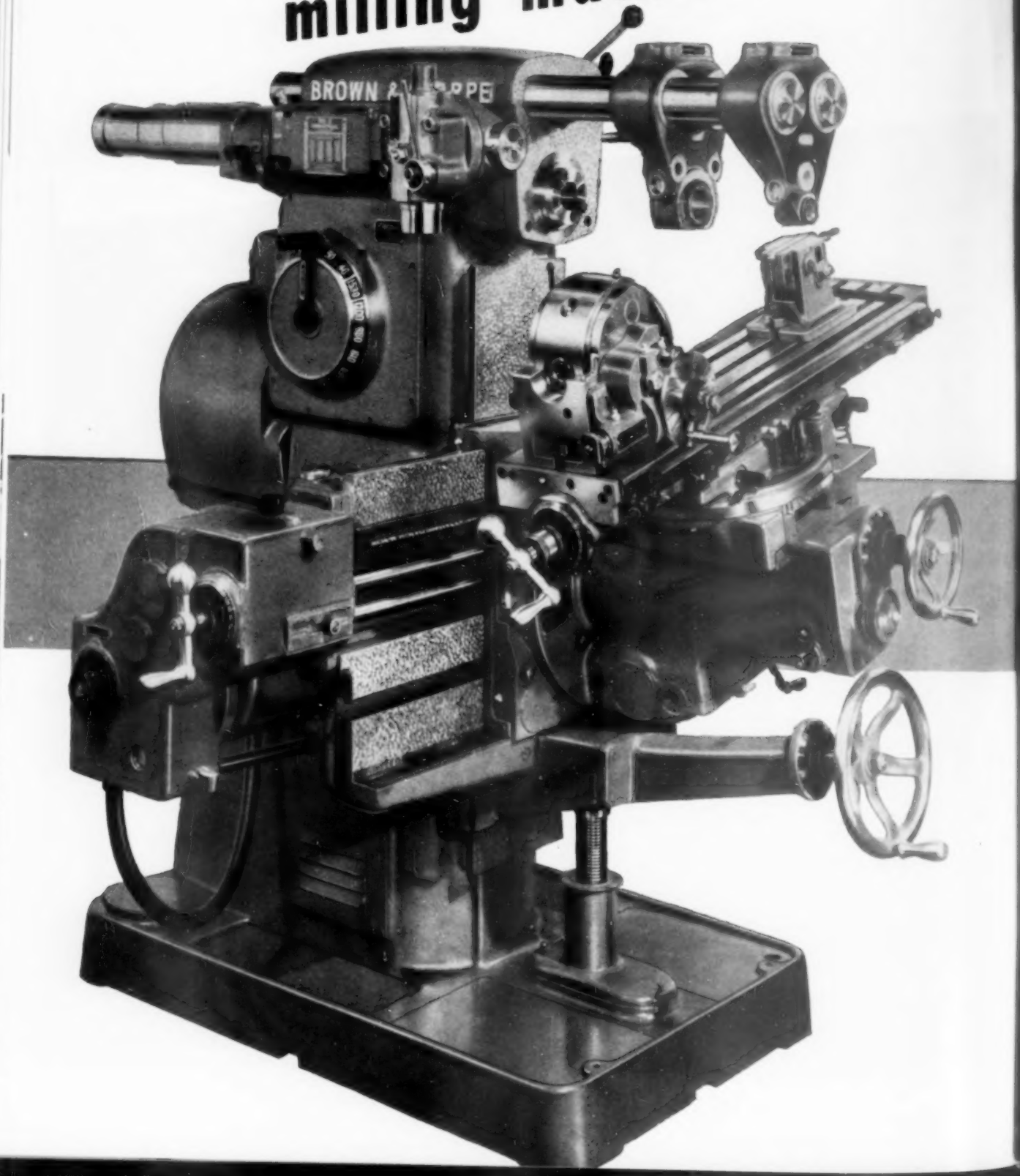
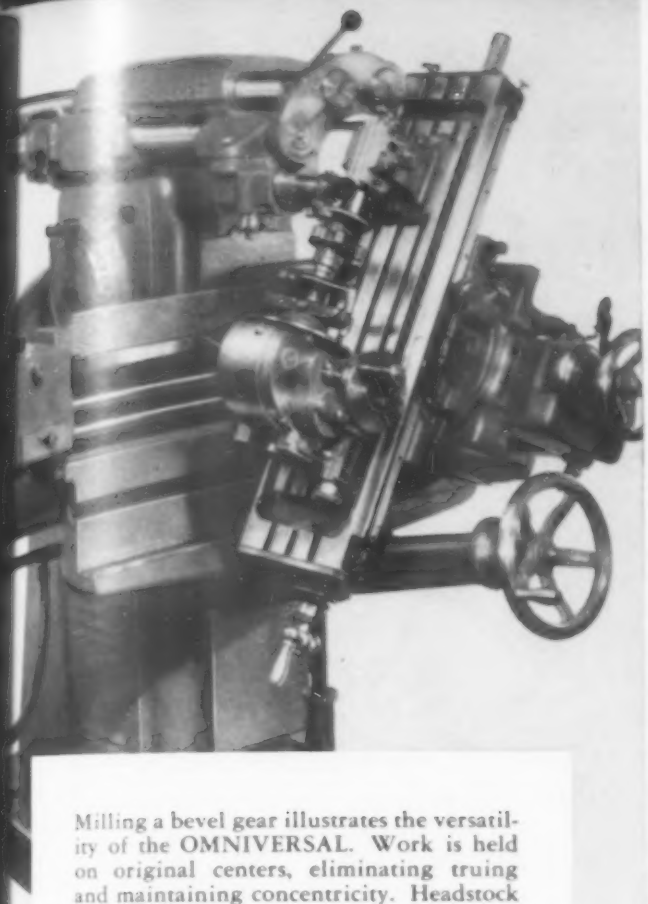
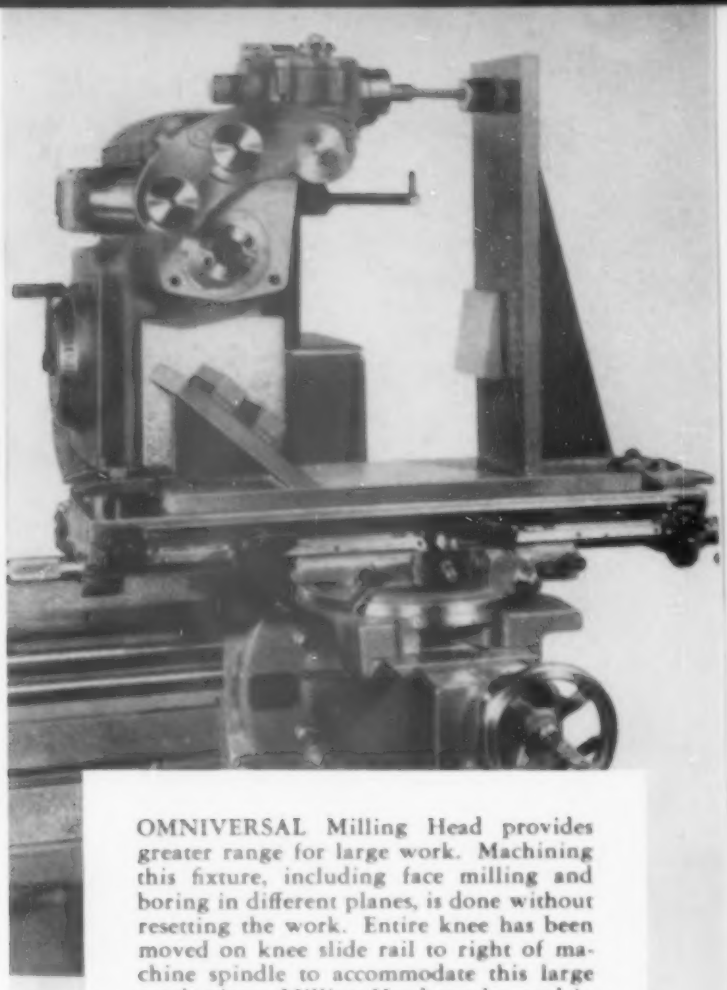




Milling a bevel gear illustrates the versatility of the OMNIVERSAL. Work is held on original centers, eliminating truing and maintaining concentricity. Headstock and footstock provide greater support and save time. Knee is readily swiveled to 60° either side of horizontal. The vernier on knee reading to 2 minutes of arc assures greater accuracy.



OMNIVERSAL Milling Head provides greater range for large work. Machining this fixture, including face milling and boring in different planes, is done without resetting the work. Entire knee has been moved on knee slide rail to right of machine spindle to accommodate this large work piece. Milling Head can be used in three column positions further increasing the machine's versatility.

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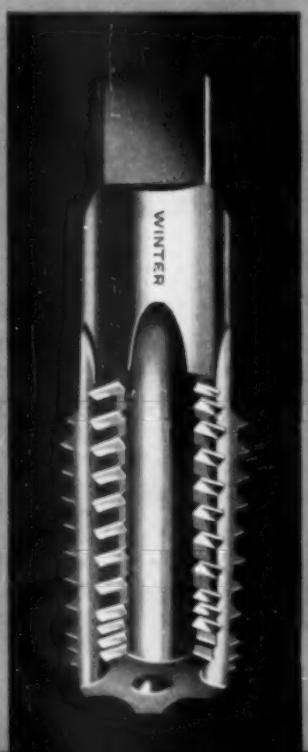

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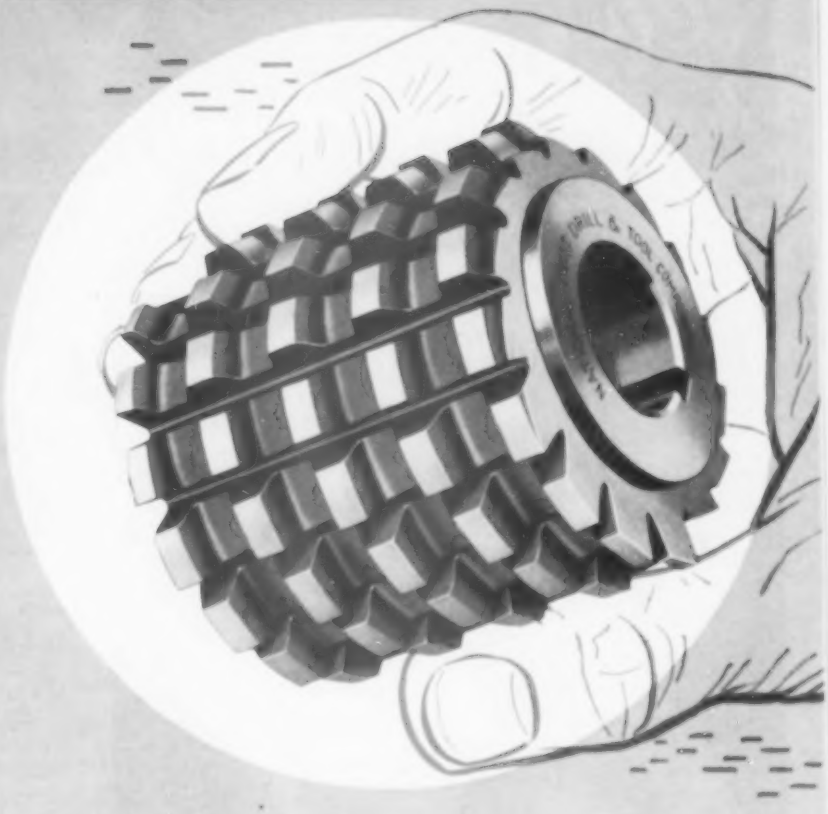

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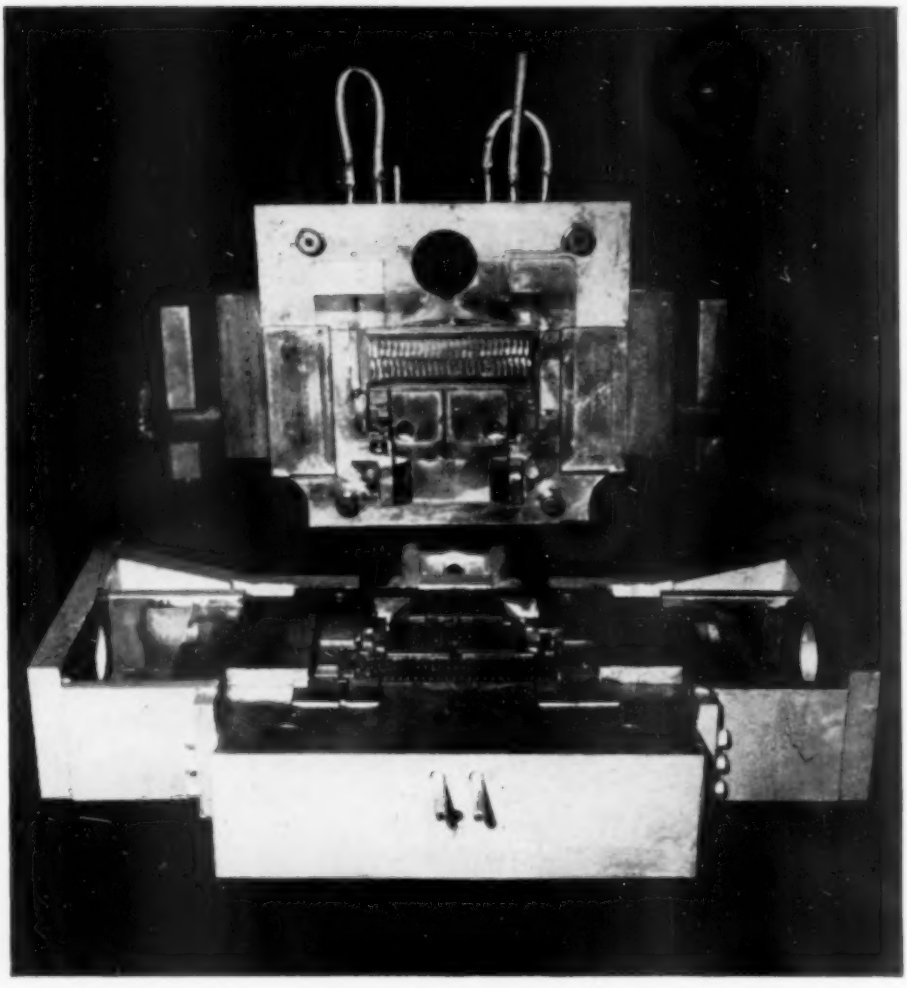

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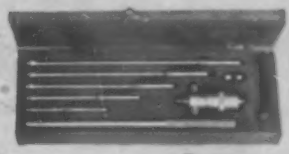

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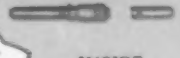

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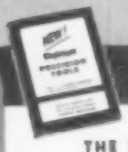

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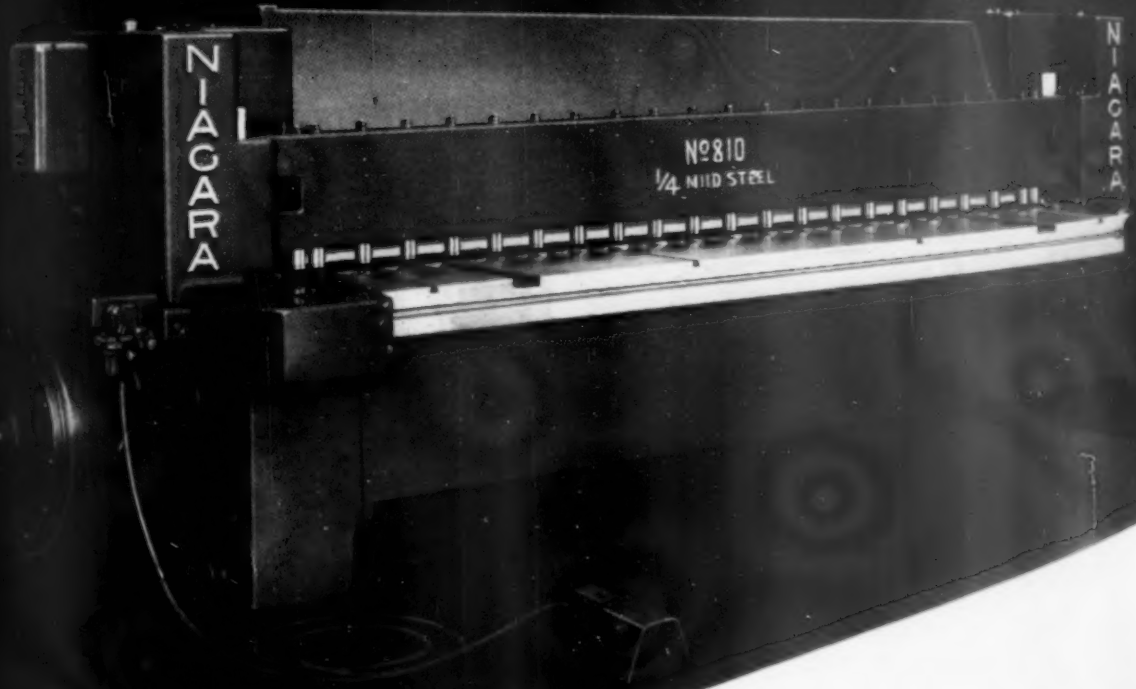

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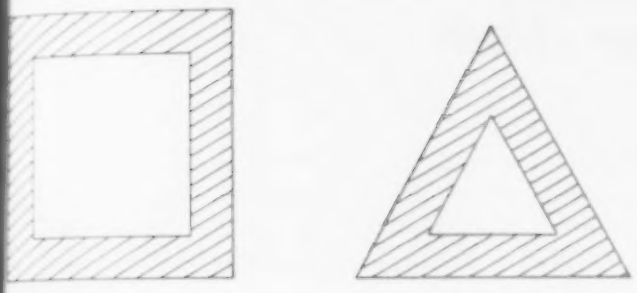

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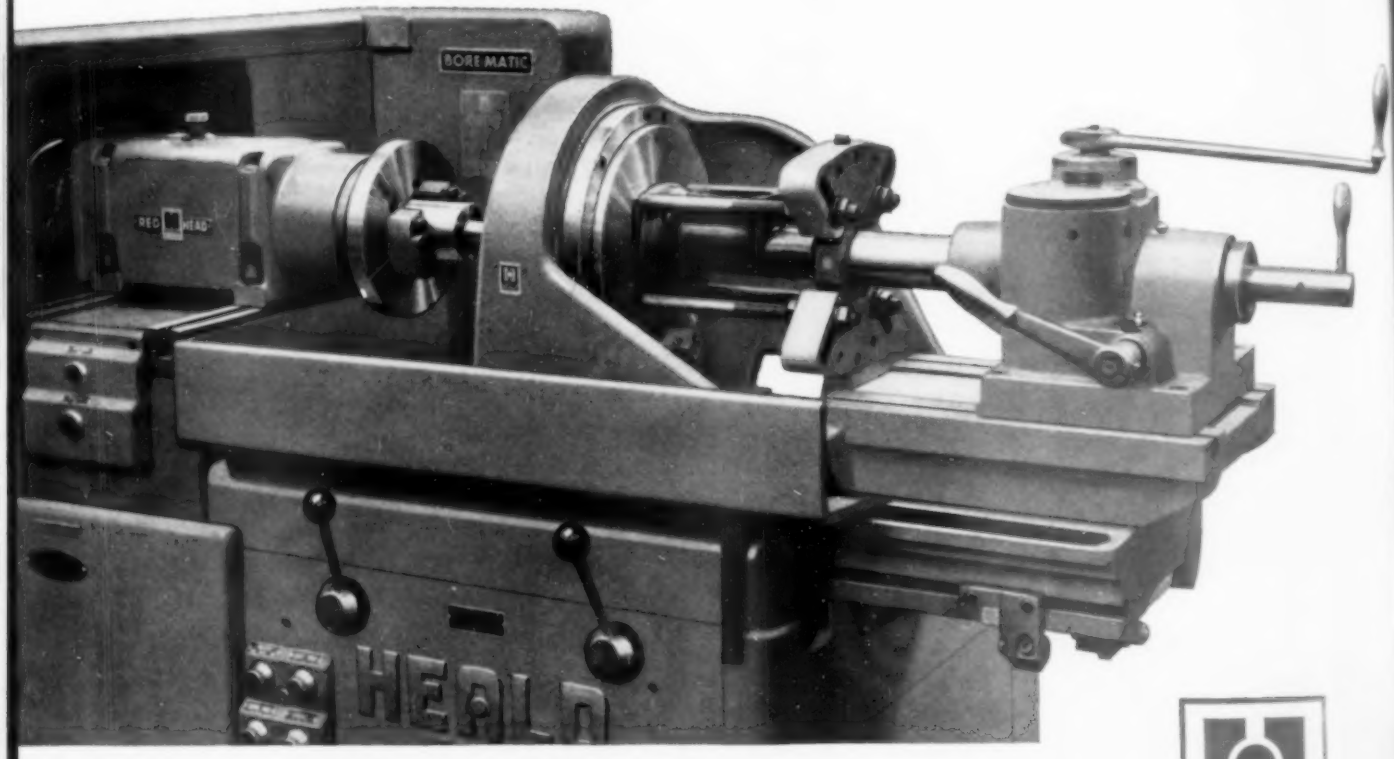

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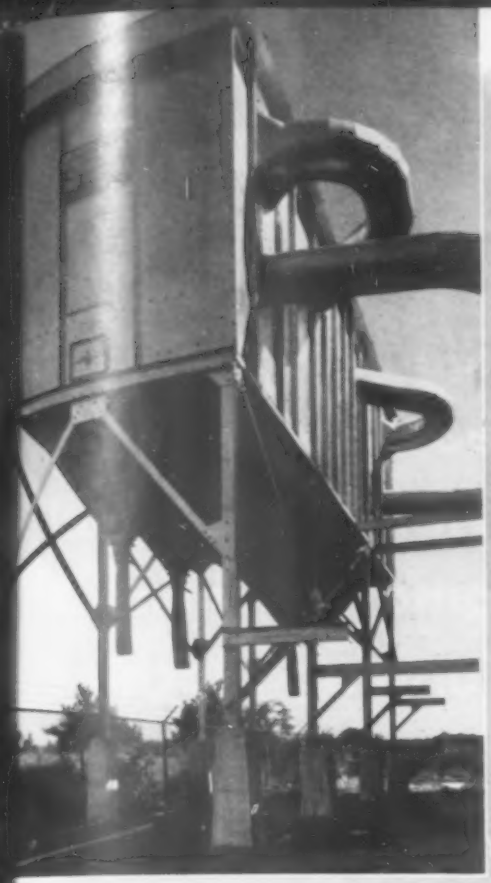
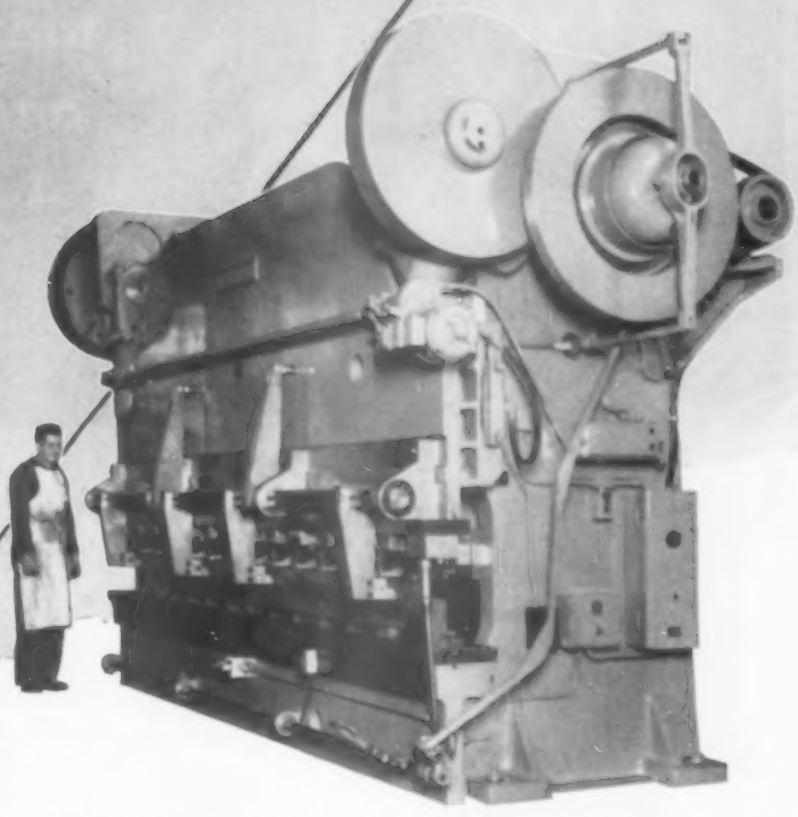


The American Dustube Dust Collector
Photo Courtesy American Wheelabrator and Equipment Corp., Mishawaka, Indiana.



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Punching time—25 pieces an hour total punching time, 2 hours for the 50 pieces.

Total time—5.0 hrs.

CINCINNATI METHOD:

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Punching time—1 1-10 hours to punch 50 pieces.

Total time—1.1 hrs.

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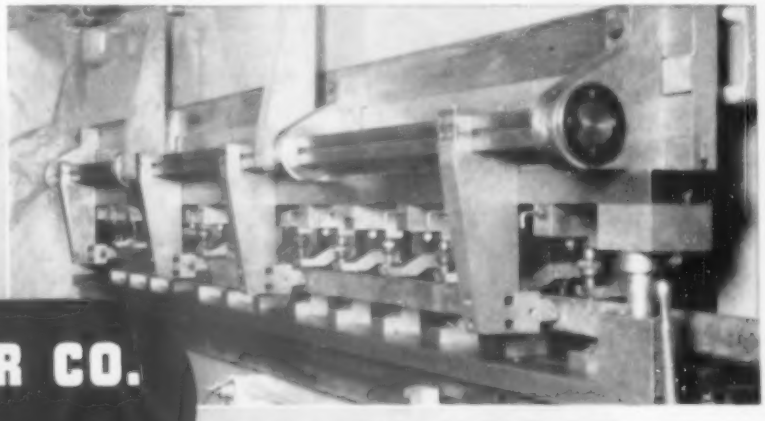

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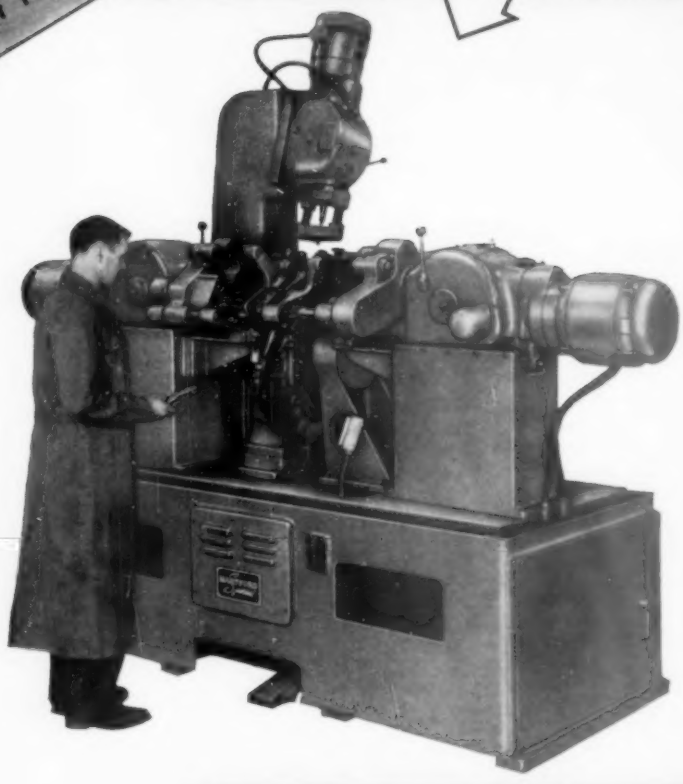

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Statistical Aids for Tool Engineering

By Lawrence E. Doyle

ASSISTANT PROFESSOR OF MECHANICAL ENGINEERING
UNIVERSITY OF ILLINOIS

Part I—Introduction to the Elements of Statistics

STATISTICS may be said to be the science of collecting, arranging and interpreting events or happenings. It offers a way of taking masses of confusing facts and extracting meaning from them. In tool engineering there is one large body of facts in every job. That consists of the dimensional variations produced by the tools. For control, those variations are bounded by tolerances. Statistics can derive valuable information from such variations and reveal much of what is happening to produce them.

To get the full benefit from statistical techniques, the tool engineer should understand the basic theory behind them. Statistics is a large field, but only a part of it is needed for most applications to tool engineering. That is mainly some of the theory of probability.

The Fundamental Concepts of Probability

If there are 49 good pieces and one bad piece in a box, the chance of picking out the bad piece is 1/50 if a person reaches in and selects a piece at random. Under the same conditions, the chance of picking out a good piece is 49/50. Also, if another box contains 5 bad pieces and 45 good pieces, the likelihood of getting a bad piece out of that box is 1/10, and of getting a good piece, 9/10.

The two examples just given illustrate the meaning of probability, which may be defined in the following manner: *If an event may happen in* m *ways out of a total possible number of* N *ways and if one happening precludes all the others and all are equally likely to happen, the probability of* $\frac{m}{N}$ *the event happening is* N. That is the ratio of the number of favorable ways to the total number of ways. It is obvious that the ratio must have a value between 0 and 1. If it is 0, the probability is that the event can never happen under the prescribed conditions; if 1, the event is a certainty. The ratio can be shown as a decimal, like 0.25 or 0.60.

Independent Events

Events do not always occur alone. For instance, consider the box having 5 bad pieces and 45 good ones. Let a piece be taken from the box at random and then be put back into the box. Then let another piece be drawn from the box. The probability of getting a bad piece the first time is 1/10; the same as for getting a bad piece the second time. These two events are independent; neither is influenced by the occurrence of the other. The probability of getting a bad piece on both draws is 1/10 x 1/10 = 0.01. This same reasoning may be extended to include any number of trials in keeping with the theorem that *the probability of the occurrence of a set of n independent events is the product of their separate probabilities.* In symbols, $p_{(s)} = p_1 \times p_2 \times p_3 \times \ldots \times p_n$.

Dependent Events

Suppose that in the example just given, the first piece withdrawn is not returned to the box before the second is taken out. What is the probability of removing two bad pieces from the box in two consecutive trials? The probability of removing a bad piece in the first draw is 1/10. If two bad pieces are to be gotten in two trials, the first piece must be bad. That leaves only four bad ones in a remainder of 49 pieces. Thus, the probability of getting a bad piece the second time is $\frac{4}{49}$, and of getting 2 bad pieces in this order is $\frac{1}{10} \times \frac{4}{49} = \frac{4}{490} = 0.0082$. In theorem form, *if two events are dependent, the probability of the occurrence of both is the product of their probabilities, but the probability of one is that which exists after the other has occurred.*

Mutually Exclusive Events

Events are mutually exclusive if the occurrence of one of them precludes the occurrence of the others. Suppose that in the preceding example two parts are drawn in succession. What is the probability that one of them is good and the other is bad? The mutually exclusive events in that case are (a) getting a good part on the first trial and a bad one on the second, and (b) drawing a bad part on the first trial and a good one on the second. The probability of (a) is $\frac{9}{10} \times \frac{5}{49} = \frac{45}{490}$. The probability of (b) is $\frac{1}{10} \times \frac{45}{49} = \frac{45}{490}$. Then the probability of either (a) or (b) happening is

$$\frac{45}{490} + \frac{45}{490} = \frac{9}{49} = 0.184$$

The theorem for mutually exclusive events is that *the occurrence of either one or the other is equal to the sum of the probabilities of the single events.*

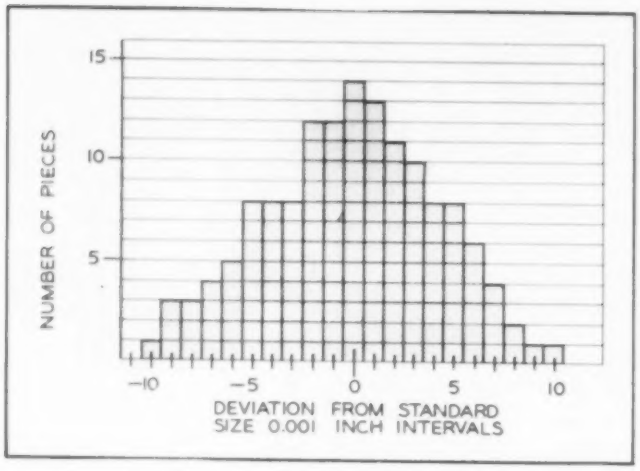

Fig. 1. A typical distribution of deviations.

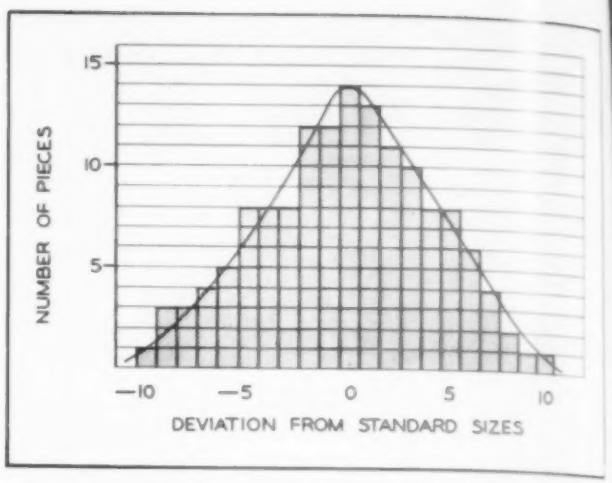

Fig. 2. Histogram with frequency distribution curve superimposed.

The Significance of Probability

Variations in a dimension are errors in reaching an ideal. In analyzing errors it is revealing to know how often small errors occur and how many large errors are likely to take place. Probability is helpful because it may be thought of as the relative frequency in the long run of events happening. Errors are events. For the occurrence of a large number of events under uniform conditions, the occurrence of one kind of event to the total number of related events may be expressed by a ratio. That ratio is approached as a limit with a large number of trials. This limit may be considered the probability of the particular kind of event happening under the specified condtions.

Frequency Distributions

If the sizes of a number of pieces taken at random from an operation were measured and the pieces were arranged according to size, an array like that of Fig. 1 would result. Each small square stands for a piece. Measurements are recorded only to the nearest thousandth of an inch. Each interval along the scale of measurement on the chart is known as a cell. Sizes in definite steps, like in Fig. 1, are known as discrete variates. This type of arrangement is called a frequency distribution and is often represented by a histogram, like Fig. 2. The number of observations under consideration is finite.

A frequency distribution is one way of grouping facts so that they can be analyzed. A grouping by itself is not an analysis, but all frequency distributions have certain properties which are useful in analysis.

TABLE I—FREQUENCY DISTRIBUTION FOR FIG. 1

X	n	nX	X	n	nX
−1	12	−12	0	14	00
−2	12	−24	1	13	13
−3	8	−24	2	11	22
−4	8	−32	3	10	30
−5	8	−40	4	8	32
−6	5	−30	5	8	40
−7	4	−28	6	6	36
−8	3	−24	7	4	28
−9	3	−27	8	2	16
−10	1	−10	9	1	9
			10	1	10
	64	−251		78	236
	78	236			
	142	−15			

$$\frac{}{X} = \frac{-15}{142} \times 10^{-3} = -0.106 \times 10^{-3} = -0.000106 \text{ in.}$$

Averages

The *arithmetic mean* or *average* is the weighted center of a distribution. It is defined as:

$$\overline{X} = \frac{X_1 + X_2 + X_3 + \ldots + X_n}{n} = \frac{\sum_{i=1}^{n} i_{x_i}}{n} \quad (1)$$

That means that the average is the sum of all the individual items divided by the total number of items. X_1, X_2, X_3, etc. stand for the individual items and n is the number of observations. The notation X_i is for any item. A bar over a symbol, like $\overline{X}$, is the statistical convention for an average.

For the frequency distribution of Fig. 1, the calculations for the arithmetic mean are shown in Table I.

Another form of average is the *median*, that measured value which has half the observations about it and half below it. If the number of items is even, the arithmetic mean of the two central items is considered the median. In Fig. 1, the median is at zero.

Standard Deviation

The *standard deviation* or *root-mean-square average* of a distribution is conventionally designated by the greek letter sigma and is defined as:

$$\Delta = \sqrt{\frac{(X_1-\overline{X})^2 + (X_2-\overline{X})^2 + (X_3-\overline{X})^2 + \ldots + (X_n-\overline{X})^2}{n}} = \sqrt{\frac{\Sigma (X_i - \overline{X})^2}{n}} \quad (2)$$

which can be shown equivalent to

$$\Delta = \sqrt{\frac{X_1^2 + X_2^2 + X_3^2 + \ldots + X_n^2}{n} - \overline{X}^2} = \sqrt{\frac{\Sigma X_i^2}{n} - \overline{X}^2} \quad (3)$$

If $\overline{X} = 0$, $\Delta = \sqrt{\frac{\Sigma X_i^2}{n}}$

The standard deviation is useful because it is a measure of the *spread* or *dispersion* of a distribution. It tells how closely the errors are clustered around the average or how widely they are dispersed.

To calculate the standard deviation of the distribution of Fig. 1 by equation (3), refer to Table II.

TABLE —CALCULATION OF STANDARD DEVIATION OF DISTRIBUTION

X		n	nX²	X	X²	n	nX²
0		14	0	—1	1	12	12
1		13	13	—2	4	12	48
2		11	44	—3	9	8	72
3		10	90	—4	16	8	128
4	16	8	128	—5	25	8	200
5	25	8	200	—6	36	5	180
6	36	6	216	—7	49	4	196
7	49	4	196	—8	64	3	192
8	64	2	128	—9	81	3	243
9	81	1	81	—10	100	1	100
10	100	1	100				
		78	1196			64	1371
						78	1196
						142	2567

and $\Delta = (10^{-2})\sqrt{\frac{2567}{142} - .106^2} = (10^{-2})\sqrt{18.08 - .01} = (10^{-2})$

$\sqrt{18.07} = 4.25 \times 10^{-2} = .00425$ in.

Standard Deviation and Distribution

The standard deviation of a frequency distribution is always related to the spread of the items in the distribution. Even if nothing is known about the pattern of a collection of items, a theorem of statistics known as Tchebycheff's Inequality divulges that a fractional part equal to or greater than $(1 - 1/t^2)$ of the collection lies within the limits of $\overline{X} \pm t\,\Delta$ (where t must not be less than 1). This means that if t is 3, more than 1—⅑, or ⅞, of all the items must be within limits set a distance of $3\,\Delta$ to the right and to the left of the average line, $\overline{X}$, of the distribution. The Δ in this case is the numerical value of the standard deviation of the particular distribution. The theorem also means that no more than ⅑ of the items will fall outside the limits. Actually, the fraction outside the $\overline{X} \pm 3\,\Delta$ limits may be considerably less than ⅑. What the inequality specifies is that the fraction cannot be more than ⅑. If more is known about the pattern, more can be inferred about the dispersion of a distribution from its standard deviation.

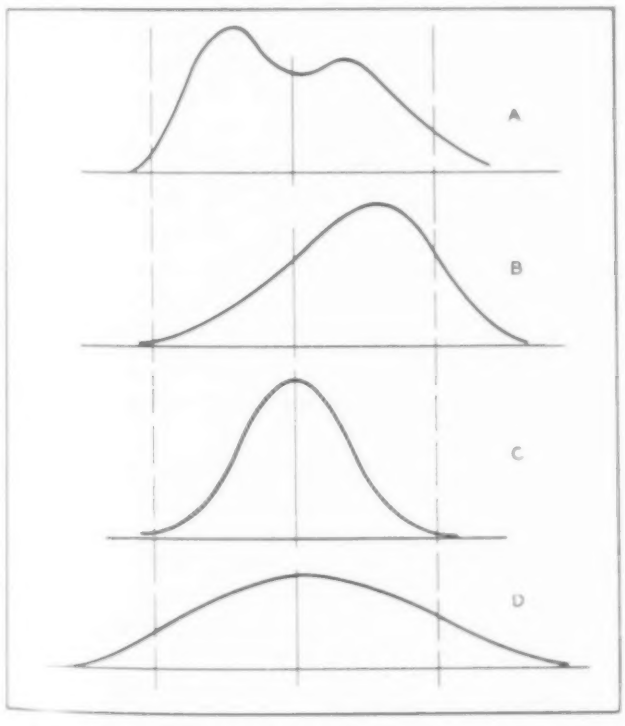

Fig. 3. Frequency distribution curve showing plotting of a great number of observations.

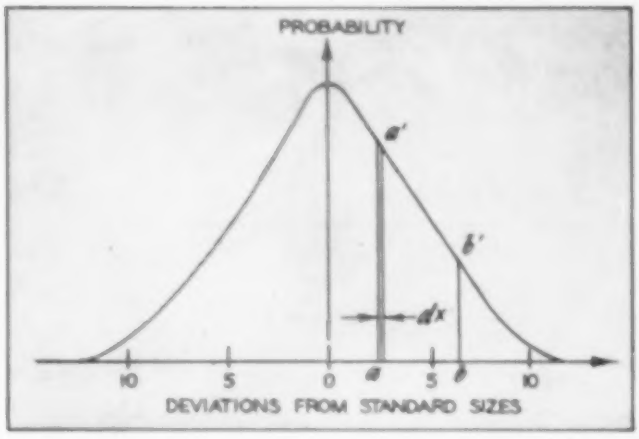

Fig. 4. Some examples of the types of distribution curves appearing in actual applications are shown above. Variations, as indicated, are extremely wide.

Frequency Distribution Curve

As the number of observations is increased to infinity and the size of each cell in a frequency distribution decreases to a point on the scale of measurement, a true curve is approached. Such a curve is known a frequency distribution curve. An example is the curve superimposed on the histogram of Fig. 2 and shown by itself in Fig. 3.

The infinite number of events, on which a frequency distribution curve is based, make up a universe. The area under such a curve represents the total probability of all the possible events in the universe and, therefore, has a value of 1. The abscissa is the scale of deviation. The height of the curve at any point denotes the expected frquency of deviations corresponding to the point. An area under the curve between any two limits is proportional to the probability of events between those limits. Thus, in Fig. 3 the area under the curve between lines a-a' and b-b' represents the probability of deviations having sizes between a and b. That area has obviously a value less than 1. For the point a alone, the probability is a small element of area aa' times dx, as dx approaches zero.

It must be emphasized that a frequency distribution curve is an ideal. Seldom is a very large number of measurements made in any one case, and any actual collection must be finite. But, a curve does outline a total universe that seems to exist on the basis of the facts available. To visualize an entire universe by representing it by a curve is convenient.

Actual distribution curves are not always regular. Examples of various distributions are shown in Fig. 4. Some are wide, some narrow, some lean to one side or the other, some are high, and some are flat. These features are evaluated by the properties of the distribution.

Averages

A frequency distribution curve bounds a theoretical distribution containing an infinite number of items. Such a distribution has a *median* and *arithmetic mean* the same as a frequency distribution of discrete variates, previously described. It also has one *mode* or more. That is where the most observations of one value occur.

The average of a universe enclosed by a curve is found by adding the infinite number of points and dividing the sum by the number of points. For summation of an infinite number of items, the notations of the integral calculus are convenient, but the notations merely stand for the process of addition just described. Thus, for a frequency distribution curve:

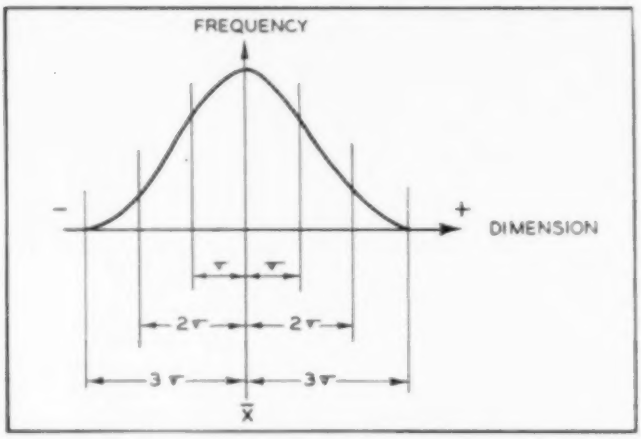

Fig. 5. The normal or Gaussian curve which, because of its properties, permits close estimating of potential variations.

$$\bar{X}' = \frac{\int_{-l}^{l} x\, f(X)\, dX}{\int_{-l}^{l} f(X)\, dX} \qquad (4)$$

The limits—l and l are the values of X at the end points of the distribution.

The prime sign, like on $\bar{X}'$, is a statistical convention that means that the symbol to which it is attached applies to a universe.

The denominator of expression (4) is equivalent to n, the number of points under the curve. By definition, that is the total probability of the distribution and is equal to 1. It also is the area under the curve and may be written,

$$A = \int_{-l}^{l} f(X)\, dX = 1 \qquad (5)$$

Because of that,

$$\bar{X}' = \int_{-l}^{l} x\, f(X)\, dX \qquad (6)$$

If a frequency distribution curve is symmetrical about the axis for $X = 0$, then $\bar{X}' = 0$.

The frequency distribution under a curve has a standard deviation that has the same meaning as that for a distribution of discrete variates. Each value of X is squared and the summation is made the same way as described for the average. Thus, the standard deviation of a curve distribution is written

$$\Delta' = \sqrt{\int_{-l}^{l} X^2\, f(X)\, dX} \qquad (7)$$

This expression means the same thing as equation 3(a), except that it takes into account a number of events approaching infinity.

The Normal Curve

One particular type of frequency distribution curve is useful because of its peculiar properties. That is the normal or Gaussian curve, an example of which is shown in Fig. 5.

A distribution of variations from a constant system of chance causes can be expected to approach that of a normal curve. For a case where there is reasonable resemblance to the normal, probable behavior can be inferred from the known characteristics of the normal curve.

The normal curve has an equation of the form

$$f(X) = \frac{1}{\Delta X \sqrt{2\pi}}\, e^{-\frac{(X-\bar{X})^2}{2\Delta X^2}} \qquad (8)$$

As indicated, the normal curve has a maximum at $\bar{X}$ and is symmetrical about the $\bar{X}$ axis, from where it recedes to zero at plus or minus infinity. The total area under the curve is defined as unity.

The dispersion of a normal distribution is determined by the value of ΔX. The proportion of the area within any $\pm t\,\Delta X$ limits is always the same. For instance, under the portion of a normal curve bounded by the $\bar{X} \pm 3\,\Delta x$ limits is found 99.73 percent of the total area under the curve. That means that 99.73 percent of all possible variations of an infinite number falls within those limits. Likewise, within $\pm 2\,\Delta$ limits there is found 95.45 percent, and within $\pm \Delta$ limits, there lies 68.27 percent of the total area under a normal curve.

If a distribution is close to normal, it is reasonably evident that something near 99.73 per cent of the events represented fall within the $\bar{X} \pm 3\Delta$ limits of the distribution. In other words, it is likely that not more than 0.27 per cent of the variation will occur outside those limits. Thus, where normal distribution can be assumed, the dispersion defined by the standard deviation can be estimated more closely than for general cases covered by Tchebycheff's inequality.

Irregularities

Some frequency distribution curves are comparatively flat, others steep. That feature is known as the kurtosis of the curve. A steep or peaked curve is shown in Fig. 4c, a flat curve at D. The rise of a normal curve is considered standard.

All frequency distribution curves are not symmetrical. When a distribution is asymmetrical, the mean, median, and mode do not coincide. The greater the lack of symmetry, the larger is the discrepancy between the mean and the mode. Such curves are said to be skewed. A skewed curve is shown in Fig. 4B.

A curve may have more than one hump, as indicated in Fig. 4A.

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Engineering Aspects of Tool and Die Welding

By Arthur R. Butler

PRESIDENT
WELDING EQUIPMENT AND SUPPLY COMPANY

Part I

TOOL AND DIE welding may be defined as the deposition by the metallic arc, atomic hydrogen or oxyacetylene processes of the basic types of tool steels such as water hardening, oil hardening, air hardening, high speed steel and hot working. These are manufactured in the form of coated welding electrodes for metallic arc welding and uncoated welding rods for atomic-hydrogen and oxyacetylene welding. In addition, there are various alloy welding electrodes used in the welding of tools and dies. Each process offers its own particular advantages, but the metallic arc method is the most widely used and will therefore be reviewed first.

Metallic Arc Welding Tools and Dies

Metallic arc tool and die welding can be separated into four distinct phases:

1. Repairing tools and dies.
2. Compositely fabricating tools and dies.
3. Correcting designs.
4. Rectifying errors.

To stress the importance of these in industry, each phase will be reviewed separately.

Repairing Tools and Dies

Existing units that fail in operation can be welded, either partially or wholly, resulting in a minimum of "down-time." The confining of repairs to immediate faulty areas reduces expense incidental to "spotting-in" and regrinding or "barbering" over entire working areas. Dimensions are retained within close limits and the use of inserts is eliminated. Valuable heat-treating time is saved as in metallic arc welding depositions of tool steel welding electrodes are "hard-as-welded." In most cases, subsequent heat-treatment, other than tempering, is not necessary if the units lend themselves to grinding. Saving in man-hours and material are thus effected.

Composite Fabrication of Tools and Dies

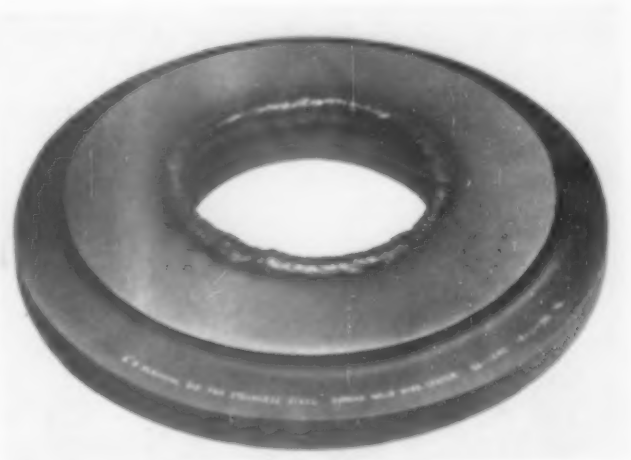
When practical, units can be compositely fabricated by utilizing a mild, medium, high-carbon or low-alloyed steel as a base and welding the cutting edges or working areas with tool steel electrodes having the desired tool steel characteristics. The ability to produce a composite tool or die, not otherwise obtainable except by welding, results in a working surface of any desired characteristic, with a resilient core. This prolongs the life of die units and avoids costly maintenance and the curtailing of production. Advantages realized include the elimination of subsequent heat-treatment, other than tempering, if the units lend themselves to grinding; permit finish machining as last operations; or the weld depositions can be annealed to facilitate machining and then subsequently heat-treated.

Many tools and dies are susceptible to breaking because of their inherent hardness. A resilient core, secured through composite fabrication, reduces this susceptibility, thereby prolonging the life of the units. Thus costly maintenance and curtailing of production are avoided.

In composite fabrication by welding, it is advantageous that the finish machining, drilling, etc., can be done as final operations.

Inserts are eliminated in composite fabrication by welding. The practice of using inserts on die units is sometimes too costly, unsatisfactory or impractical as, unlike welds, they never become integral parts of the die units. In a great many cases, small die units do not lend themselves to insert usage.

Sometimes it is impractical to construct a die out of one type of tool steel if the die must perform individual func-



"Hard-as-welded" deposits of oil hardening electrodes constitute the cutting edge on this ring. No subsequent heat-treatment other than tempering was necessary.

High-carbon, high-chrome air hardening cold trimmers before and after welding with air hardening tool steel electrodes.

tions, such as one that must trim, form and spank or restrike. It is impossible to secure composite tool steel in one unit with the qualities necessary to perform each of these operations. This can be accomplished by welding, on the cutting or working areas, depositions having the desired characteristics to perform each individual operation.

Correcting Design

Welding facilitates making changes in contours, corners or edges of tools and dies to correct design during die "try-outs," or die "change-over." In a great many cases original die units, under the stress of the work they are performing, will not stand up. The entire cutting or working area may be affected or sometimes only partially so. Tool steel welding will permit the addition of requisite surfaces at desired points thereby reducing the possibility of subsequent failure and necessary replacement.

Rectifying Errors

In the manufacture of tools and dies, welding permits the correction of errors and in some cases replaces conventional inserting methods which are used as an expedient.

THE METALLURGY OF WELDING

Contrast to Hard-Facing

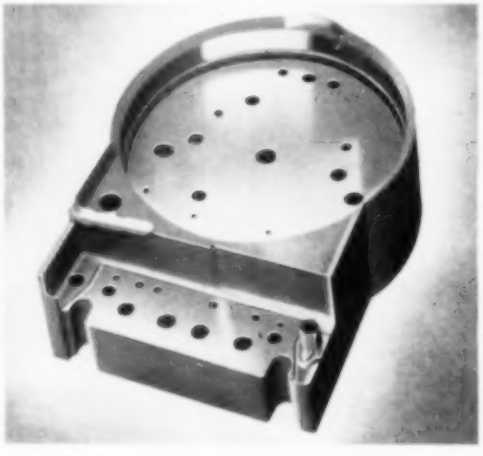
Tool and die welding electrodes are distinguished from hard-facing welding rods and electrodes in that they differ widely in composition and physical or mechanical properties. Hard-facing or hard-surfacing materials were primarily developed to produce high hardness in combination with extreme resistance to abrasion. They are highly alloyed and contain in varying amounts alloying elements such as carbon, chromium, tungsten, molybdenum, cobalt, nickel, etc. Generally, the iron content of these products is much lower than the combined amount of alloys present. As a result, weld depositions made with hard-facing materials will not, as a rule, respond to heat-treatment because of their high alloy content which results in unchanging and unvarying hardness. Their coefficients of expansion and contraction are also very low. Contrastingly, tool and die welding electrodes differ widely in composition and physical or mechanical properties.

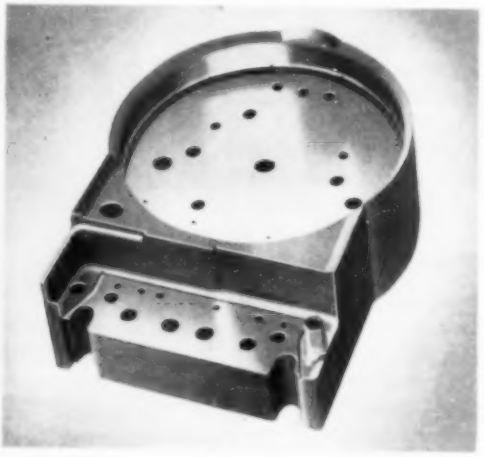
Tool and Die Welding Electrodes

The commonly used tool and die welding electrodes can be divided in two distinct categories. In the first group are basic tool steel welding electrodes such as water hardening, oil hardening, air hardening, hot working and high speed steel. It is highly desirable that coated electrodes utilized in tool and die welding be minerally alloyed with various elements that are ferrous in character. The electrodes are in an annealed state and the weld metal is hardened by air quenching from the high heat of the arc, approximately 6200 deg F. The weld depositions are "hard-as-welded" regardless of whether they are applied to hardened or annealed tool steel or to mild, medium, high-carbon or other alloyed steels. The weld depositions can be annealed, to facilitate machining, and then heat-treated and tempered. As a general rule, weld depositions will respond to heat-treatment recommended for the average tool steel in its classification.

The second group of tool and die welding electrodes is classified as alloy welding electrodes. These are used in the welding of forging, drawing and forming dies. They generally produce medium-hard weld depositions which are machinable and not affected by heat-treatment. They can be secured in various types, each producing varying degrees of weld hardness.

There are other alloy welding electrodes that are sometimes used in conjunction with the harder alloys. They comprise a group of nickel, nickel-iron, copper-nickel and Monel electrodes which are used as a foundation on cast structures





This plastic mold die is an example of how tool steel welding is used to make changes in contours, corners or edges in order to correct designs during the die tryout or changeover periods.

units preparatory to facing them with the harder alloy or tool steel electrodes.

As previously mentioned, tool and die welding electrodes should contain mineral alloyed coatings which are conducive to a desirable spray action of the arc and formation of a protective slag. The electrodes should operate equally well with a-c or d-c currents. However, the use of tool and die welding electrodes should be limited, as much as possible, to the current for which they were specifically designed. The introduction of a mineral alloyed coating on the electrodes is desirable as it insures the incorporation of the requisite alloys in the weld depositions. The percentage of alloying elements lost during the welding operations is compensated for by incorporating them within the coating itself.

Weld depositions of tool and die welding electrodes should be porosity-free and absolutely sound and homogeneous. Laboratory tests have indicated that weld deposit structures are superior, in many cases, to steel of the same class. Micrographs definitely prove that grain structure is improved during the welding process due to the fact that the metal is actually re-refined and alloyed as it goes through the arc stream.

Tool and die welding electrodes on the market are of the coated variety. Some of these are simply coated with deoxidizing and fluxing agents, while others have interal alloyed coatings.

Table I can be used for determining recommended uses and the properties of the welds produced with the popular tool and die welding electrodes. These can be employed to metallic arc weld the diversified types of tool steel on the market.

(To Be Continued)

Table I—Selection of Electrodes for Welding Applications

Electrodes	For Welding or Repairing	Properties of Welds Produced
Water Hardening Tool Steel	Damaged or worn tools and dies in the typical water hardening class. Also for compositely fabricating water hardening units, using a mild or medium carbon steel as a base.	Typical straight carbon water hardening tool steel deposits are "hard-as-welded"—can be heat-treated — approximate hardness 56-60 Rockwell C.
Special Water Hardening Tool Steel	Damaged or worn tools and dies in the typical water hardening class. Also for compositely fabricating water hardening units, using a mild or medium carbon steel as a base.	Typical carbon-vanadium water hardening tool steel deposits are "hard-as-welded"—can be heat-treated — approximate hardness 56-60 Rockwell C. Heat-treated deposits more uniform in hardness than those of the water hardening tool steel electrodes.
Oil Hardening Tool Steel	All types of tools and dies in the oil hardening class—especially those of the "manganese", "tungsten" or "chromium" types of non-deforming or non-shrinking steels. For compositely fabricating oil hardening units using a mild, medium or high carbon steel as a base. Also for converting existing tool steel units into composite ones by facing the cutting or working areas.	Typical oil hardening, non-shrinking tool steel deposits having excellent grain structure and cutting qualities, withstanding extreme shock. "Hard-as-welded" deposits can be heat-treated—approximate hardness Rockwell C.
Air Hardening Tool Steel	Damaged or worn dies of the standard 5 percent chromium varieties and also the "air" and "oil quench" high-carbon, high-chromium types. For compositely fabricating units using a medium high-carbon or SAE steel as a base. Also for converting existing tool steel units into composite ones by facing the cutting or working areas.	Typical air hardening—5 percent chromium—non-deforming deposits which are "hard-as-welded" can be heat-treated—approximate hardness 60-62 Rockwell C.
Standard Hot Work Tool Steel	Damaged or worn "chromium", "tungsten", "high-carbon chromium", "chromium-tungsten" or "molybdenum" hot working steel dies used in hot working metallics and non-metallics. For compositely fabricating hot working units using SAE steels of the nickel-chromium varieties as a base. For converting existing cold working units into hot working ones by welding standard hot work tool steel electrodes on the cutting or working areas.	Typical chromium-molybdenum-tungsten hot working tool steel deposits which are "hard-as-welded." Can be heat-treated. Approximate hardness 50-54 Rockwell C.
Superior Hot Work Tool Steel	Damaged or worn "chromium" or "tungsten" hot working steel punches, dies, headers, trimmers, etc., used in hot working metallics and non-metallics. For compositely fabricating hot working units using SAE steel of the low nickel-chromium varieties as a base. For converting existing cold working units into hot working ones by welding superior hot work tool steel electrodes on the cutting or working areas.	Carbon-molybdenum-chromium deposits having extreme hardness and abrasion resistance at high heats. Deposits are "hard-as-welded" and can be heat-treated. Approximate hardness 58-62 Rockwell C.
Special Hot Work Tool Steel	Damaged or worn "chromium", "tungsten", high-carbon chromium", "chromium-tungsten" or "molybdenum" hot working steel dies used in hot working metallics and non-metallics. For composition fabricating hot working units using SAE steels of the nickel-chromium varieties as a base. For converting existing cold working units into hot working ones by welding special hot work tool steel electrodes on the cutting or working areas.	Typical chromium-molybdenum-tungsten hot working tool steel deposits which are medium "hard-as-welded." Require no heat-treatment as deposits are machinable. Approximate hardness 36-42 Rockwell C.
High Speed Steel	Principally where high speed steel characteristics are desired on cutting edges or over working areas. Not recommended for repairing high speed steel cutting tools.	Typical molybdenum high speed steel deposits which are "hard as welded." Excellent cutting qualities in combination with desirable toughness. Can be heat-treated. Approximate hardness 60-64 Rockwell C.
Low Alloy	Flame hardening cast dies, plastic molds, zinc die casting dies; SAE castings, forgings, shapes, structures, etc.	Respectively typical SAE 4130 and 6145 steels adhering to type analyses and heat-treatments.
High Nickel-Chrome	Deformed, broken or spalled areas on hot or cold forging dies of the carbon types of "chrome-nickel", "chrome-molybdenum", "chrome-nickel-molybdenum" and "chrome-molybdenum-manganese" varieties. On cast structured or carbon steel drawing and forming dies. For creation of bearing surfaces to restore and provide anti-frictional characteristics. For miscellaneous repairing and fabricating—shafts, drill tangs, riveter set heads, clutch dogs, steel gear teeth, pneumatic tools, hammer rams, etc. On components subjected to medium heat such as valve seats, billet hoots, forging tongs, etc. High nickel-chrome electrodes on zinc die casting dies—to effect repairs to deformed, broken, spalled, or heat checked areas, and to repair fractured tool steel die sections.	Medium hard alloy deposits which are machinable. Exceptional tensile strength. Work hardens in use. Resists abrasion and frictional heat. Takes high polish and is austenitic or non-magnetic. Resists metal pick up, erosion and corrosion. Is not affected by heat-treatment. Approximate hardness of deposits when peened 240-360 Brinell, 3000 kg. Also available to produce non-machinable welds having approximate hardness of deposits, when peened, of 440-460 Brinell, 3000 kg.

Optical System Developed for Building Large Jigs and Fixtures

By Gilbert P. Muir

At a recent demonstration Republic Aircraft Corporation revealed its work for the past three years with the Air Force in developing an optical system of building large jigs and fixtures. Using optical instruments brought from Britain, and German castings received at the Farmingdale, N. Y., plant after World War II, the system is said to provide a simplified and less costly method of building jigs and fixtures for plane manufacture.

A Phase One study of the method has been completed under contract with the Air Materiel Command, and Republic plans extensive use of the procedure in tooling for future versions of the F-84 Thunderjet fighter-bomber.

The general principle of the optical tooling system is to establish beams of light as reference lines in lieu of the use of mechanical devices and, in combination with adequate positioning equipment, to coordinate the fixture matching points with the established lines of sight or light beams.

The basic line of sight (a collimation line) is established by coordinating the alignment of a telescope positional on an anchored base at a specific point at one end of the assembly fixture with an illuminated target similarly positioned at the opposite end or at an intermediate point of the fixture. Any number of auxiliary collimation points may be established. Intermediate fixture points at any desired spacing may be related to the collimation line by interposing and aligning an alluminated target (the collimator) on a movable support in the established line of sight of the telescope. By replacing the collimator with an optical square on the movable support and aligning it in the line of sight of the telescope, it is possible to locate fixture points at any desired position in a plane normal to the collimation line.

Objectives of the Study

The general objectives of this development program include:

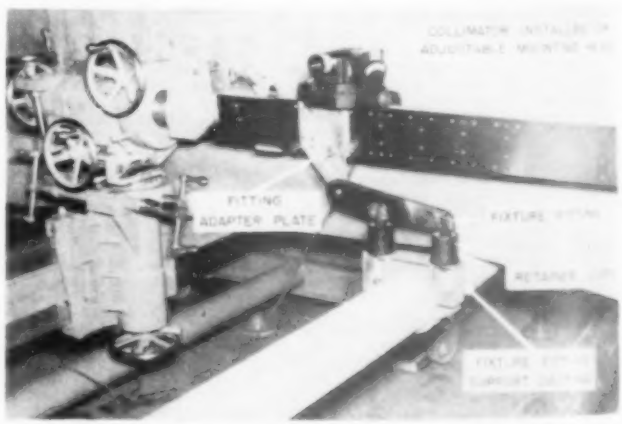
1. Reduce the cost of tools, thereby reducing the cost of the end product and better preparing us for emergency production.
2. Improve the accuracy of assembly fixture construction to meet indicated tooling requirements for future high speed aircraft.
3. Design large assembly fixtures to permit transportation in small units by air and to make stockpiling in dispersed areas practicable.
4. Simplify the system of erection of assembly fixtures to permit training of comparatively inexperienced manpower for the production of fixtures in the event of an emergency.
5. Devise a system to enable the jig builder to erect fixtures to a dimensional accuracy that will provide interchangeability without the use of masters for coordination. The advantages of this in a mobilization program are very obvious.
6. Devise a system for erecting fixtures such that, when manufacturers other than airframe producers are required to build assembly fixtures, designs as well as know-how can be passed on to them.

Recommended Fixture Construction

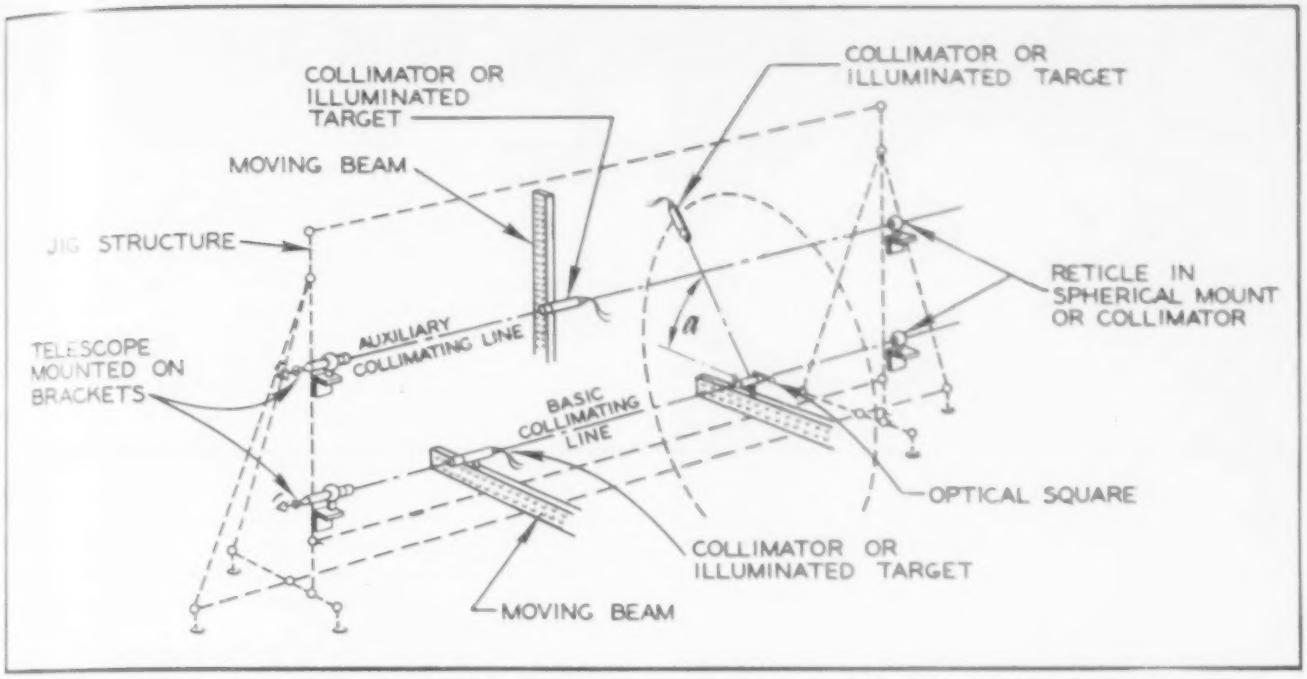
It has been concluded that tubing, assembled with bolted standard castings for the build-up of large assembly fixtures, provides a basis for attaining the design objectives: interchangeability, lower cost, use of unskilled labor and rapid knockdown for shipment, reuse or changes. Castings are used for assembly of all parts including fixture bracing, fittings and brackets for alignment instruments, thereby eliminating all welding in assembly of the fixture.

During studies on the fixture design, it was decided to construct two test fixtures; one of the conventional welded construction and the other employing the German castings assembled with bolts.

In aligning the welded and bolted assembled structures for comparison purposes, the conventional wire, plumb line and transit method was used on the former while the optical system was used on the latter. Shelves for support of the



Above are shown the details of the fixture fitting support castings as well as the retainer cups positioned for pouring metal for foundation support. Development of this fixture mounting was a basic factor in developing the bolted castings structure.



General principles of optical tooling are illustrated in the sketch above. Alignment of telescope at left is coordinated with illuminated target shown at center and reticle at right. Collimator on movable support is replaced by an optical square, then aligned in the line of sight of the telescope to locate fixture points at any desired position in a plane normal to the collimation line.

telescope and target reticle were installed on the welded fixture to check accuracy, but these were not included in the welded fixture manufacturing time. The time required for the manufacture and set-up of the two types of test fixtures using the respective alignment systems is shown in Table I.

In the cast and bolted assembly, all tubing, which is of standardized diameter, is cut to length and assembled to the cast bases and auxiliary fittings. The base castings can be assembled into various combinations to provide for specific fixture requirements. Locating bases for the fixture fittings are also bolted in place and where necessary these castings as well as any of the main structure castings may be locked in place by means of taper pins. The bases need not be accurately located inasmuch as the method of anchoring the fittings to the structure after location by the universal optical positioner provides for adjustment in all directions.

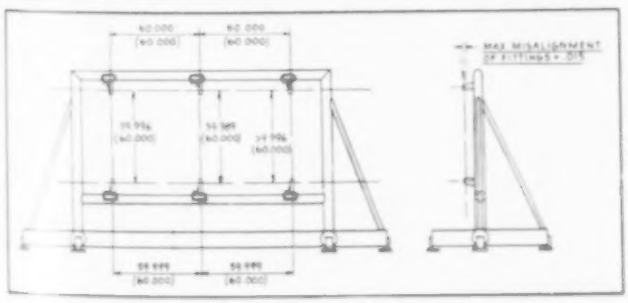
TABLE I—COMPARATIVE SETUP AND MANUFACTURING TIME FOR WELDED AND BOLTED CASTING STRUCTURES

Welded Structure	Man-hours
1. Detail manufacture and erection	65.0
Cut and fit pipe	6.0
Manufacture mounting pads	10.0
Manufacture angles and plates	10.0
Weld structure	91.0
Total	24.0
2. Install and align fittings (6)	115.0
3. Total fabrication and setup time for welded structure	
Bolted Casting Structure	**Man-hours**
1. Detail manufacture and erection	7.5
Manufacture six fittings	5.0
Manufacture one adapter plate	8.0
Manufacture four shelves for instruments	8.0
Cut and fit pipe	20.0
Erection of structure	4.0
Taper pin castings to structure	2.0
Install fixtyre cups	54.5
Total	14.5
2. Establish two collimation lines and install and align six fittings	69.0
3. Total fabrication and setup time for bolted structure	

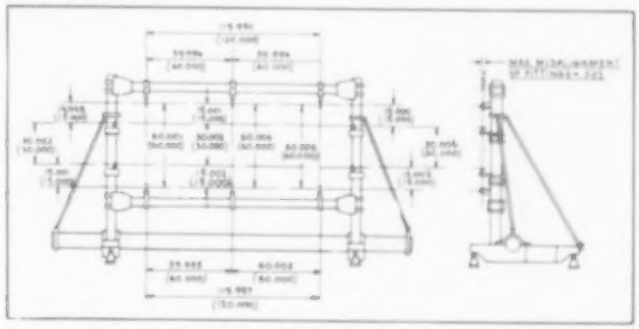
Anchoring Fittings for Fixture

A significant problem in designing the standardized type fixture was to provide adjustment for positioning the fixture fittings without either using shims or relocating the previously installed fitting support castings. In addition, a method had to be developed for subsequent permanent mounting of the positioned fittings to their supports with a minimum of labor and within desired tolerances.

Several methods were investigated, and finally a molten casting material was selected as the most practical. Retainer cups which could be permanently installed on the fixture were developed, as well as fittings with extensions which would project into the open cups. After experimentation, cerrotrue was found to be a satisfactory material for this application, in that it was compatible with fixture materials during its cooling period.



A comparative test for accuracy of the two respective methods is shown in the diagrams above. At left is shown the conventional method of setting jig points. The spacing of these fittings using standard scales can be held within ± 0.010. In this case the linear



spacing of the fittings was accomplished using the optical system measuring rods as an additional check on their accuracy. At right is shown the universal optical positioner method of setting jig points.

Designing Fixtures for Band Saw Applications

By H. J. Chamberland

RESEARCH ENGINEER
THE DOALL COMPANY

INGENIOUS BAND MACHINING fixtures now in use to provide accurate duplication of cuts or otherwise speed production number into the hundreds, naturally, attachments and accessories of standard design frequently help to increase the efficiency of many of these shop-made devices. Although predominating in the metalworking field, the furniture, plastics, ceramics, glass, printing, garment and other industries likewise make extensive use of fixtures with their respective types of band machines. Many fixtures are more or less of specialized designs but with minor alterations many of these might well be adapted to somewhat similar applications. The typical examples described here should prove a source of ideas to help solve many shop problems along band machining lines.

The fixture shown in Fig. 1 fits closely into one of today's most common production headaches; short runs of sheet materials. This device is used in a large electrical appliance manufacturing plant to saw segments for induction coils from sheets of mica 0.012 in. thick. Made of mild steel, the fixture functions in connection with the circle-cutting attachment of the machine, the top plate being provided with a properly located center drill hole to act as a pivoting point for the radius adjusting arm of the attachment. The 125 sheets, uniform in width, form a securely guided full stack in the fixture; a small hole is drilled into the machine table for a removable pin used as a stop for advancing the stack for each cut.

This type of fixture can obviously prove as effective to stack cut metal sheets of brass, copper, zinc, aluminum, magnesium or any other material by using the proper band control factor in each case. Increased cutting height, width of sheet and radius should have negligible effect on fixture design. The top plate may be provided with two or three thumb screws to bind the stack while cutting, the sheets should expectedly be of uniform width with a fair allowance to avoid binding in the fixture for free movement of the stack.

A fixture is not necessarily required for similar segmental work on steel sheets, even with a stack of full machine cutting height capacity. For example, even the light model band machine provides for stack sawing as many as 300, 150 and 75 units of $\frac{1}{32}$, $\frac{1}{16}$ and $\frac{1}{8}$ in. stock respectively. If the parts are substantial in size and of heavy gage, they should preferably be bead welded under pressure in an arbor press at various locations that will not interfere with the repeated cuts. Smaller stacks of thin gage stock are gen-

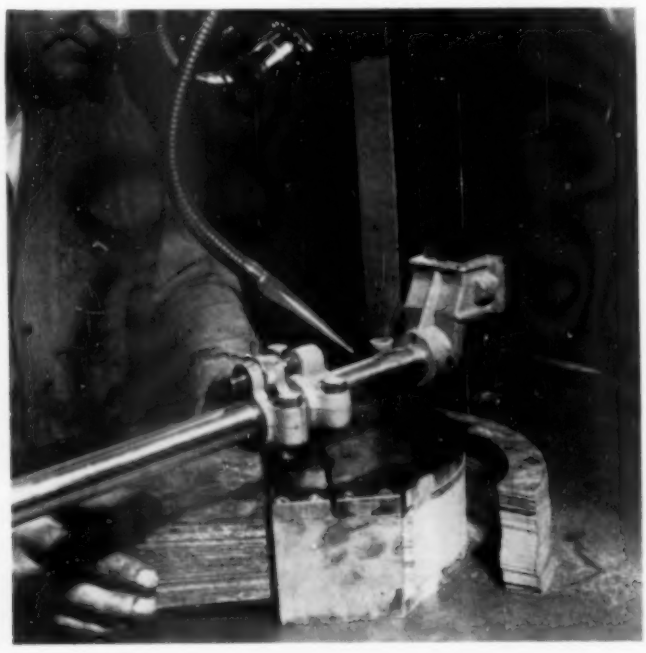


Fig. 1. General-purpose type of fixture adapted to band saw machining segments of sheet materials, as used with circle-cutting attachment of machine.

Fig. 2. Circle-cutting attachment used without fixture to saw radius on diesel engine connecting rods. Wider band was used to machine cutouts, was then substituted with 3/16 in. band shown.

ally or at soldered by holding them in a vise. The stack is made to function as a fixture by a simple layout of the required number of spacings, center drilled in line in the top sheet. This sheet should be of $\frac{1}{8}$ in. stock at the least, drilling the locations previous to welding or soldering. An improvised center for the attachment should be made rather than flatten the point of the regular one.

Fig. 2 shows how another plant makes good use of the profile-cutting attachment to band machine, in part, forged diesel engine connecting rods. The operation in progress consists of radius cutting the ends of the parts from properly located center drill holes in each. Note supporting V-block strapped thereto to ease its circular manual movement. The preceding operation on these connecting rods was also to machine the cutouts by taking parallel straight cuts on each piece, blocked and strapped to the hydraulically operated table. The locating hole is in the partly sawed section to continue with the full radius cut as already outlined. The circular piece on the machine table is simply a plywood pad following the movement of the connecting rod to stabilize it at the base throughout the cut.

Both of these operations were formerly executed by milling at more than three times the present operating cost. Another manufacturer produces connecting rods from 10 in. thick special steel by band machining them more than 80 percent. Limited production prohibits forging dies which would more than triple present production cost.

This principle was applied to expedite the cutting of pipe or tubing. The base of the fixture is fitted with ball bearing wheels to ease its infeed movement under control of the mechanical feet attachment. Length of cut depends on machine model, the maximum throat capacity being 60 in. The hand wheel operates with a Vee-style strap for locking the pipe or tube material. Needless to mention that for cutting various diameters of this stock, adapters could be used to good advantage.

Fig. 3 shows another fixture of the roller bearing type but one of a substantially more general-purpose design. Unfortunately, the nature of the part shown being band machined cannot be divulged but the purpose of the fixture can. This fixture is representative of two auxiliary tables fitted with four sets of rollers each to travel at right angles. The fixture is first set on the specially enlarged machine table at right angle to its actual position to take the horizontal cut, it is then reset as shown for the parallel cut.

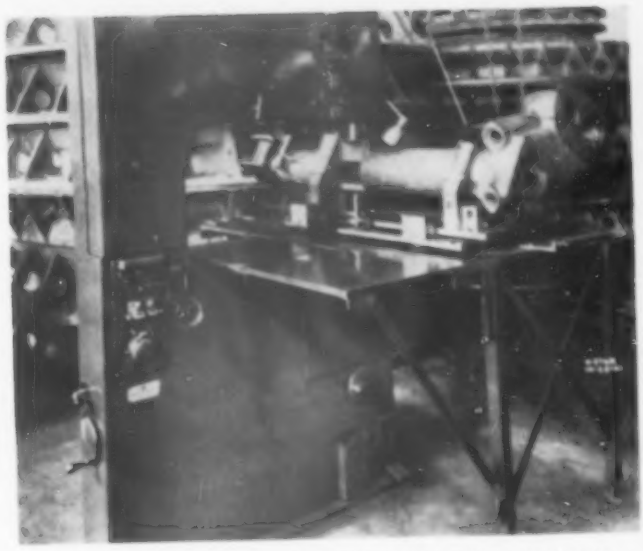


Fig. 3. Roller bearing-type fixture developed to saw cuts at right angles in 1200-lb casting.

Because band filing is inseparable from band machining practice, fixtures are therefore a part of this continuous filing process and the one shown in Fig. 4 is typical of many such devices to speed quantity production of more or less volume. In Fig. 5 is a makeshift set-up to file flats on the ends of small shafts. No less important is the use of the mechanical feed in this connection for uniform work pressure and to remove the maximum of material per minute, because this is the only exception with the cutting of metals when chips really pay dividends. The method of filing by which chips are produced does not change their weight; what counts is the time consumed by each method to remove a given amount of material and continuous filing has some outstanding facts and figures in its favor.

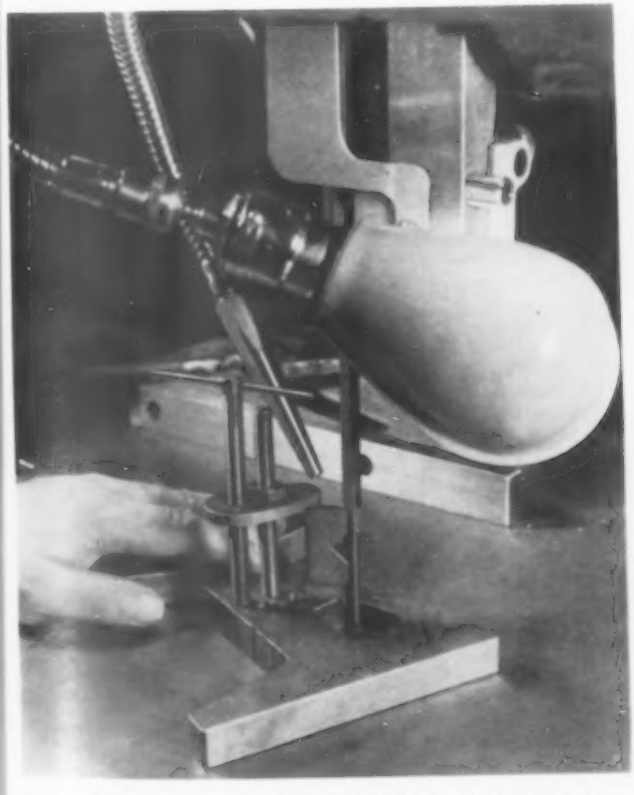


Fig. 4. Typical fixture developed to hold hard-to-handle parts for band filing.

Fig. 5. Band filing flats on small shafts. Plates clamped on table can substitute for fixtures on small or periodic runs.

Accuracy in Machining—

Its Standardization and Cost

By Tom H. Vogel
KEARNEY & TRECKER CORPORATION

Part II

THE ISA TOLERANCE SYSTEM as previously described, like any other tolerance system, consists of a theoretical frame, a network of figures based on some mathematical formulas, which are chosen to suit the practical requirements as closely as possible. When putting such a system into practical application, a number of errors and inaccuracies in conception can often be discerned, especially at the initial stage, which unless corrected may cause all the advantages of such a system to become illusory.

Accuracy Versus Cost of Machining

We first sought to determine a relationship between accuracy and cost of machining, as management believed that too high accuracy at times was the reason for too heavy production costs;

The designer in his office is free to require on his drawings any accuracy, any quality contained in the tolerance system which he considers necessary. Often anxious that his design will really work, he chooses too good quality and in that way increases manufacturing costs considerably, in most cases without realizing it.

Some experts have stated that when the equipment of the shop and training of the personnel has been adjusted to a desired range of precision, comparable accuracy can be achieved with relatively little effort. This statement is true within limits, but the relationship, however, is always relative. The production of a certain quality will be less costly in a shop which has been equipped for the required precision than in another shop which is equipped better or worse and also has a working force which is accustomed to more exact or less exact work. In each case, there is a certain optimum. However, taken as an absolute, high precision is definitely more expensive because primarily it requires better and more expensive machinery, and, secondly, more highly trained men are necessary for the operation of these machines. If pieces of low accuracy have to be made in a shop which is adapted to high precision work, they will be comparatively expensive. The rates are higher on expensive machinery and the operators are not used to producing lower quality work. Consider what would happen if the lathe work of a boiler shop would have to be done in a department for small Diesel engines. We see, therefore, that there is a very definite close relationship between accuracy, production, machinery available, and the skill of workers. If we ask for a precision higher than necessary we not only make the piece itself more expensive, but increase the production costs for pieces of lower precision as well. Therefore good practice will never specify a higher accuracy than is absolutely necessary. In terms of tolerances it is important that the quality of a fit is chosen in such a way that the next greater tolerance would make the workpiece unsatisfactory.

The cost increase with higher accuracy has so far merely been stated, unsupported by any proof. Unfortunately, a

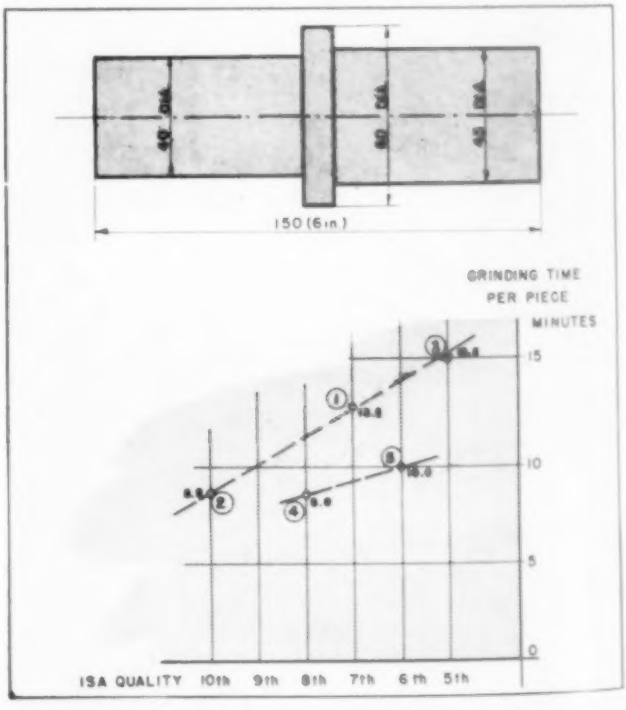


Fig. 7 (top) is the test piece for experiments illustrated in Figs. 8, 9 and 10. Fig. 8 (bottom) shows results of grinding test pieces. Numbers refer to sequence of production. Test indicates that routine of operator had greater influence on grinding time than required accuracy. Test therefore was not conclusive.

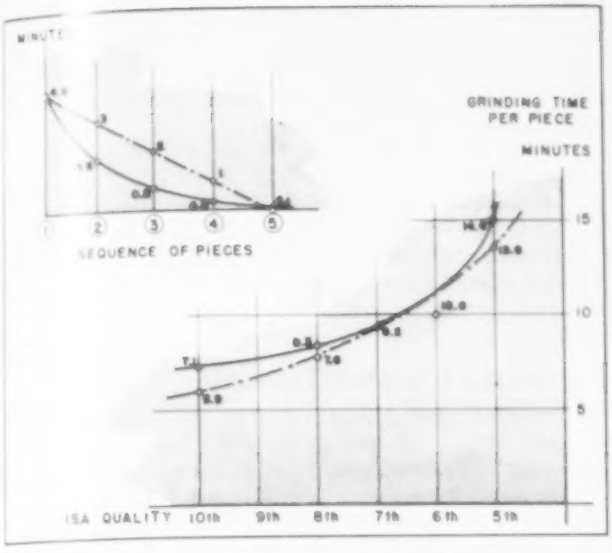


Fig. 9. Two empirically plotted routine curves. Test indicates how grinding time decreases when more pieces are made and operator acquirs greater efficiency. Fig. 10 (bottom) shows curves obtained when values of Fig. 8 are diminished by values of Fig. 9.

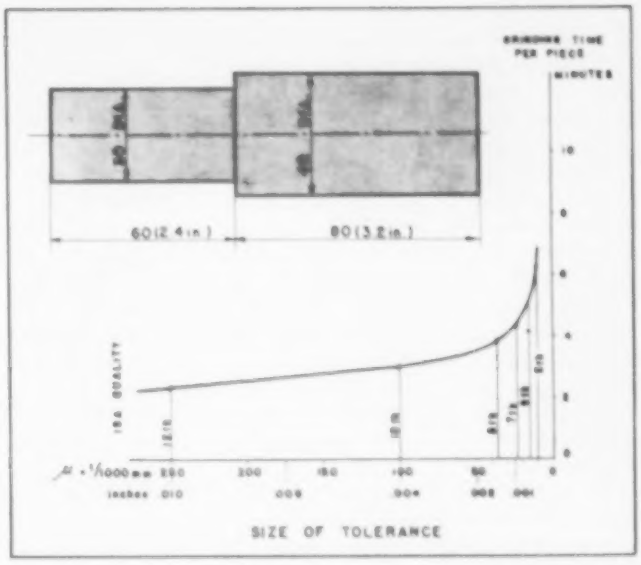


Fig. 11 (top) illustrates test piece used for experiments shown in Figs. 12, 13 and 14. Fig. 12 (bottom) indicates increase of grinding time with smaller tolerances. Ten pieces were made of each ISA quality.

search for literature containing data concerning the problem of accuracy of manufacture in relation to its cost was almost without results. In most cases general statements, unconfirmed and unsupported by any measurements, have been made.

Initiating Shop Experiments

The following statement has been taken from a thorough and complete discussion of this subject in a book by P. Leinweber: (1) "The thoughtlessly written 0.001 or 0.0001 waste more money and man power than some design that is poorly planned." In a paper published in 1932 by the VDI, (2) a curve (Fig. 6) was found which is quite informative but unfortunately does not give any information regarding the means and methods of its origin.

Since records of such investigations were not available from outside sources, the only alternative was to take some basic measurements in the shop.

It appeared obvious that at the beginning, these tests had to be confined to a simple case in order to obtain useful results.

All further external influences such as overhead of machine, quality of worker, number of pieces, material and hardness of surface were not taken into consideration.

The ISA tolerance system was chosen as a means of measuring the quality of the test pieces. This had a great advantage in that it permitted staying within normal shop production limits and did not require unusual effort on the part of the operator. Further, the necessary control instruments such as regular snap gages were already available.

To approach as closely as possible actual production conditions, a test piece was designed which had two diameters and a collar, all three of a specific accuracy (Fig. 7). One piece each of the ISA qualities IT 5, 6, 7, 8 and 10 were produced. The turning remained the same for all pieces which meant that 0.3 to 0.4 mm (0.012 to 0.016 in.) stock was left. The following grinding operation should serve to demonstrate the different time requirements dependent on quality. It was thought that the influence of routine which a worker acquires when he makes a larger number of similar pieces would affect the necessary grinding time. The pieces would therefore not be made according to quality, but according to a specified sequence.

Effect of Human Influence

The results of this first series of tests can be seen from the chart in Fig. 8. It is clear that all operations which are under human influence, such as the grinding of these test pieces, are subject to heavy fluctuations. An especially reliable and regular operator was chosen to do the work. To average the variations, all grinding times for the three diameters of one particular quality were added, but no definite curve through the five points measured could be drawn. The effect of the sequence of production along with the routine of the worker turned out to be more pronounced than the difficulties of the job itself.

Two routine curves were then plotted empirically (Fig. 9). One is straight and one approximately exponential. It might be thought that the working time would decrease in some such manner depending on the number of parts produced. If the measured grinding times (Fig. 8) were decreased by those of the theoretical routine curves (Fig. 9), the two curves in Fig. 10 would be obtained. The latter ones correspond to what could be expected as a result of this test. Thus it is shown only that the result of this test as such is not usable.

Second Series Undertaken

In a second series of tests it was decided to have ten pieces of each quality made so that the influence of routine would be reduced. All other conditions were kept similar as possible. Identical material was used, and the same operator employed. The test piece was simplified by eliminating the collar (Fig. 11). A sequence of operations was established in which test pieces of the qualities 6, 10, 8, 5, 12 and 7 were to be made consecutively.

The results of this second series of tests can be seen in three diagrams. In Fig. 12 the grinding time is plotted versus the size of the tolerance. The steep increase of the curve with increasing accuracy is much more obvious here than when the time is plotted in relation to the ISA standard (Fig. 13). The time measured comprises the actual grinding and handling time. The grinding time includes the

(1) ...ung und Gestaltung." Dr. Ing. P. Leinweber, Springer, Berlin, 1942.

(2) ...chselbeziehung zwischen Konstruktion und Herstellungskosten." VDI Berlin, 1932.

time used for measuring the workpiece with a snap gage. The handling time includes chiefly machine adjustments and dressing of the grinding wheel. This non-machining time increased noticeably with increasing accuracy. For the production of the ten most accurate pieces (fifth quality) it was necessary to dress the wheel three times while for the seventh quality, only one dressing was sufficient for the whole series of ten pieces. Particularly informative is Fig. 14 which indicates the average number of measurements required in order to finish a diameter. It rises linearly and steeper than the time curve. Thus the working time increased less in proportion than other requirements such as nervous strain and intensified concentration, which are made upon the operator when higher precision is required. Here we are confronted with a condition which often is not given sufficient consideration when the difficulty of an operation is appraised and piece rates are set.

These curves give only an approximate idea of the increase of manufacturing cost with higher accuracy. As all investigations of production economy are subject to human and other influences, which are never constant, only a great number of tests could lead to a reliable answer. The above results should not be taken as absolute, but it is believed that the more or less exponential rise of the curves approximates actual conditions fairly well.

Application in the Shop

Now since it was proven that the effort increased with higher accuracy, the two following questions arose:

1. Are there any pieces made in this shop which are more accurate and therefore more expensive than necessary?

2. Are the pieces really as exact as required by the drawing?

Since the drawbacks mentioned previously are more pronounced with greater accuracy, main attention was focused from the beginning upon the finest ISA quality, IT 5, used in the shop. For this purpose, a number of workpieces with "h5" tolerances were taken out of the normal production and checked in a test room. In most cases, an electronic comparator, which is easy to handle and has an accuracy of ± 0.001 mm, (0.00004 in), was used. The results can be stated as follows:

One of 220 pieces which had h5 tolerances, 55 percent were scrap which means 55 percent of the dimensions were not within the required tolerances.

This was an alarming result. Of all the pieces made by the men in the shop with great consciousness and care, checked by the usual methods (with micrometers and snap gages) and accepted to conform to requirements, half of them were found not to lie within the prescribed limits. It appeared also that a great number of these theoretically "scrap" pieces were used later without rework and never gave cause to any disturbance.

Evaluation of Needed Tolerance

After these observations it had to be concluded that a tolerance of the 5th quality is very hard to obtain with the means of production and measurement available in the average shop. Micrometers and snap gages have a practical accuracy of about 0.0005 in., the limit beyond which errors may become considerable. Therefore this very accurate 5th quality should be avoided wherever it is not absolutely necessary, and this appeared possible with few exceptions.

In cases where a very tight fit is needed, it will often be cheaper to produce the pieces a little less accurately and later select parts so that the required fit is obtained. In mass production this is often done by dividing the lots of pieces in groups of various sizes with an automatic measuring and segregating device. Interchangeability in these cases will of course not be generally possible anymore.

Unjustified Precision

These distribution tests of a great number of pieces led also to interesting observations about the frequency of occurrence of individual sizes and the relationship to the nominal tolerance. Two particularly informative curves are reproduced in Figs. 16 and 18. The first one shows the sizes of 50 pins of 85 mm diam, Fig. 15, compared with the limits of the required tolerance zone of 85 –h5. Thirty percent of the pins were oversize, but since a clearance of 0.080 to 0.120 mm for the wrist pin in the piston was foreseen by the drawings, this oversize did not affect the use of the pieces. Here we have a typical example, where a very high precision had been asked for without any justification.

The graph in Fig. 18 shows the influence of an additional disturbing factor. Not only were 30 percent of the screws

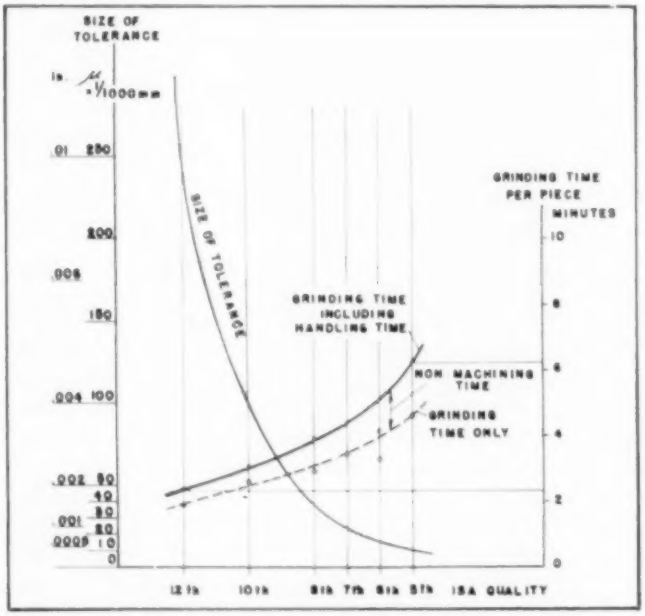


Fig. 13. Values of Fig. 12 plotted over the ISA qualities. The "size of tolerance" curve shows exponential decrease of ISA tolerances with higher ISA qualities.

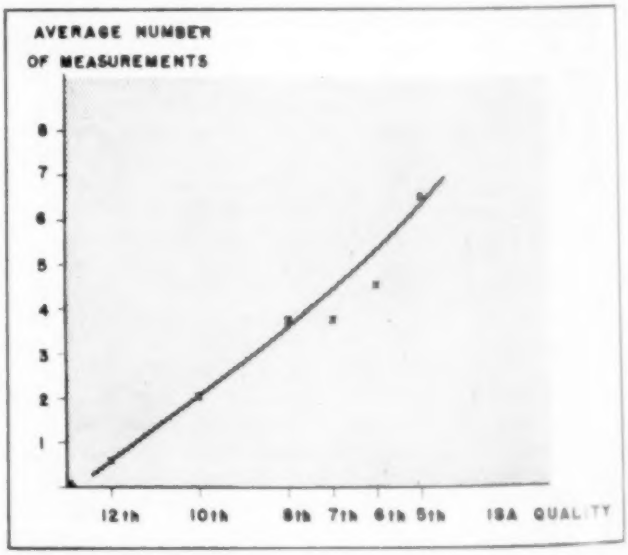


Fig. 14. Shown above are number of measurements with snap gages necessary to finish one diameter of the test piece shown in Fig. 11. Note rise of curve in comparison with Fig. 13.

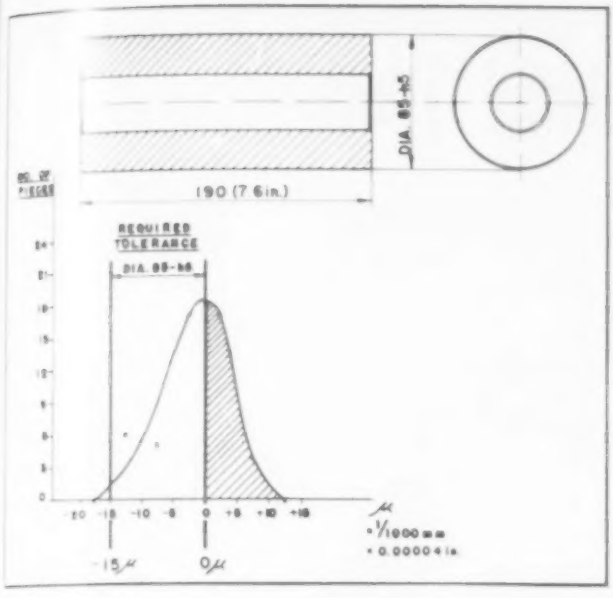


Fig. 15 (top) shows the diesel engine wrist pin measured in Fig. 16. Results of these fifty wrist pins are shown in Fig. 16 (bottom); checking was done with an electronic comparator. Thirty percent of the pieces measured were oversize.

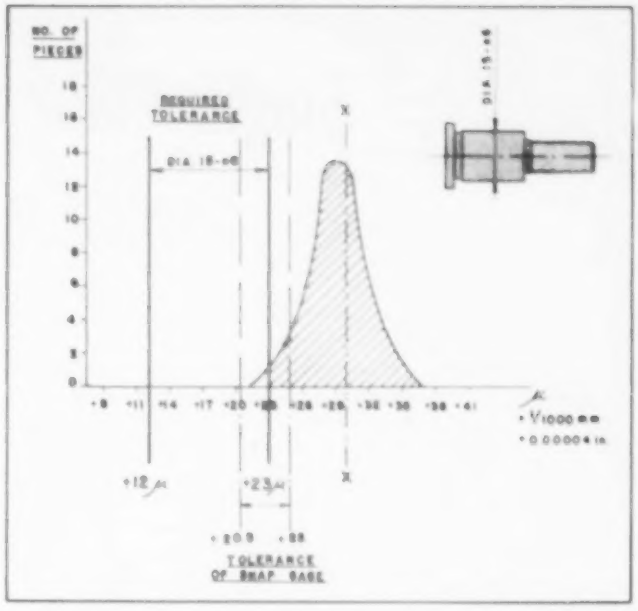


Fig. 17 (top) illustrates the dowel screw measured in Fig. 18 (below). The plotting of Fig. 18 shows checked pieces all oversize, but snap gage used by inspector had been worn beyond limit. Line X-X indicates actual size of gage when controlled.

shown in Fig. 17 larger in diameter than the actual size of the snap gage used for checking, but the gage had worn so much that it was 0.005 mm oversize, when checked to discover the cause to the existing discrepancies in workpiece size. The reason for this was that the operator of the centerless grinder had been applying too much pressure on his snap gage in order to accelerate work and make more money on his incentive plan. Snap gages were normally checked only after completion of a whole series, which in this case counted several thousand pieces. That is why the error, when finally discovered, was quite considerable. Practically all of these pieces had to be reworked, of course.

A comparison of many such distribution diagrams indicated the same trend, namely, that they have the characteristic bell shape of a probability curve and lie near the upper limit of the tolerance zone instead of being centered between both limits.

Misunderstanding of Tolerances

This observation illustrates that in the shop there is often an incorrect conception of the significance of a tolerance. Shop men many times incorrectly believe that an attempt should be made to approach the upper limit or the "Go" side of a tolerance zone. Instead, the effort should be aimed at staying midway between the limits. There then remains enough play on both sides to avoid having scattered pieces beyond the limits. Even so there are still sufficient factors which cause all shaft measurements to tend toward the upper limit:

1. The fear of the operator to remove too much material and make scrap by falling below the low limit.
2. The wear of the gage.
3. Too much pressure applied during measurements. When the worker is in a hurry, snap gages are often forced over the pieces.
4. Temperature of the gage in the hand: if a large number of pieces have to be made it may happen that the operator keeps the gage in his hand during an entire day. The gage then acquires the body temperature while the workpiece might be from 25 to 50 deg F cooler. The result is a possible deviation in tenths of thousandths of an inch.

The curves showing distribution of frequency of occurrence finally lead to another important observation about fits and their selection. Whenever larger series of shafts as well as holes have been measured accurately piece by piece, the distribution of the frequency of all measurements results in a bell-shaped curve. As just mentioned, considerable effort should be given to locate the maximum of this curve as close to the middle of the tolerance zone as possible. Relatively few pieces will then lie near the limits of the zone. In assembling a shaft and a hole manufactured according to this principle, the prevailing clearance or interference becomes the difference between the mediums of the two tolerance zones of the hole and the shaft. As the majority of all pieces are concentrated around these averages, the probability is small that two pieces of extreme sizes will be put together.

Advantages of ISA System

In selecting a fit giving a desired clearance or interference a designer should therefore consider the center of tolerance zones and not the extreme values as is still often done in practice.

These are a few examples of errors—the most drastic and therefore most instructive ones which were met—as they occur with the use of a tolerance system, especially when it is new and the way it works has not yet been entirely understood by those who have to deal with it. There is the tendency to require too high accuracy and too close fits on one side and the tendency on the other not to follow accurately what the drawings prescribe. However, once these difficulties were overcome, experience with the ISA Tolerance System was very satisfactory.

The harmonic proportions which underlie this system, the extreme flexibility in its application and the clear and simple designation of any quality and fit may be especially stressed here. A quick look on any drawing tells immediately what kind of accuracy and fit are necessary at any particular place where a dimension with a tolerance is involved.

The experimental data reported herein are based on investigations made at Sulzer Bros. Ltd., Winterthur, Switzerland.

Single Point Cutting Tools—Theory and Practice

By K. E. H. Moltrecht

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Part II

THE SIDE CUTTING EDGE has an important effect on the metal cutting operation which is sometimes entirely overlooked. When turning, the side cutting edge angle allows the tool to enter the work so that the intial load is taken some distance away from the nose of the tool which is the weakest part of the tool. This is especially important when using cemented carbide tools. Fig. 7 also illustrates how the side cutting edge angle acts to release the load in a gentle manner when running out of a cut.

An important effect of the side cutting edge angle is the thinning of the chip as this angle is increased. This is illustrated in Fig. 8 where two tools are cutting at the same rate of feed, F_1 and F_2, and with the same depth of cut, D_1 and D_2. A study of the figure clearly shows that the thickness of the chip T_2, resulting from tool B having the larger side cutting edge angle, is thinner than the chip T_1 from tool A. It should also be noted that the chip from tool B is distributed over a longer area of the cutting edge than the chip from tool A. This can be noted by comparing the lengths L_1 and L_2. It can thus be seen that an increase in the side cutting edge angle will result in a longer thinner chip. This effect can be further increased by rounding cutting edge as shown in Fig. 9. The effect of increasing the length of the chip is to distribute the heat generated by the cut over a longer area thus allowing for better heat dissipation from critical cutting area. The decrease in the thickness of the chip reduces the built up edge resulting in an improved surface finish.

Large Side Cutting Edge Desirable

From the standpoint of efficient cutting action, it is desirable to have a large side cutting edge angle, although there is a practical limit to the size of this angle. When the cutting tool emerges the work it exerts a horizontal force against the work which will tend to push the work away from the tool. This can be observed when turning a thin unsupported workpiece as shown in Fig. 10. Likewise, the work will exert an equal and opposite horizontal force against the cutting tool which can be observed by the deflection of a slender boring bar as shown in the same illustration. The direction of these forces is shown in Fig. 11 at normal or right angles to the cutting edge. Thus it can be seen that the direction of these forces can be controlled by the side cutting edge angle or by the manner in which the side cutting edge is applied to the work. If the side cutting edge is applied so that it is at right angles to the work, the force exerted against the work will be parallel to its axis and the axis of the lathe as shown at A in Fig. 11 and B in Fig. 12. The force can be said to be directed parallel to the axis of the work. If the side cutting edge is applied at an angle to the work, the force will be directed so as to cross the axis of the work at B in Fig. 11 and A and C in Fig. 12.

It should be observed that it is the manner in which the side cutting edge is applied that is important and not necessarily how it is ground. A tool that has 0 degree side cutting edge angle can have an effective side cutting edge angle if it is applied as shown at A in Fig. 13. Likewise a tool having a large side cutting edge angle can have a 0 degree effective side cutting edge angle if applied as at B.

When a piece is turned in a lathe whose length is several times its diameter as in Fig. 12, the manner in which the side cutting edge is applied may have a decided effect on the cutting action that takes place. If the side cutting edge is applied as at A in Fig. 12, the force against the work will be so directed that it will cross the axis of the work near the middle of the work during part of the cut. If the magnitude of the force becomes large enough it will push the work away from the tool. If the work is stiff enough, it will spring back after being pushed aside. This action will

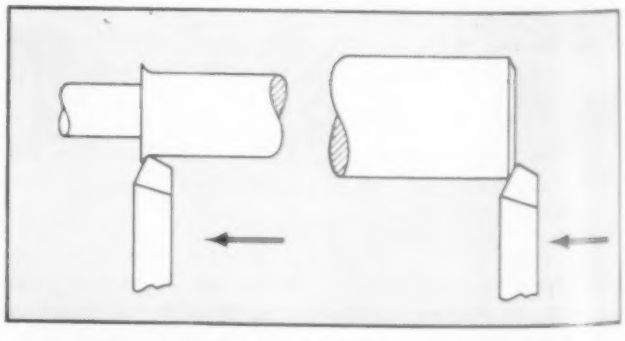


Fig. 7. The side cutting edge angle, as shown above, acts to release the load gently when running out of the cut.

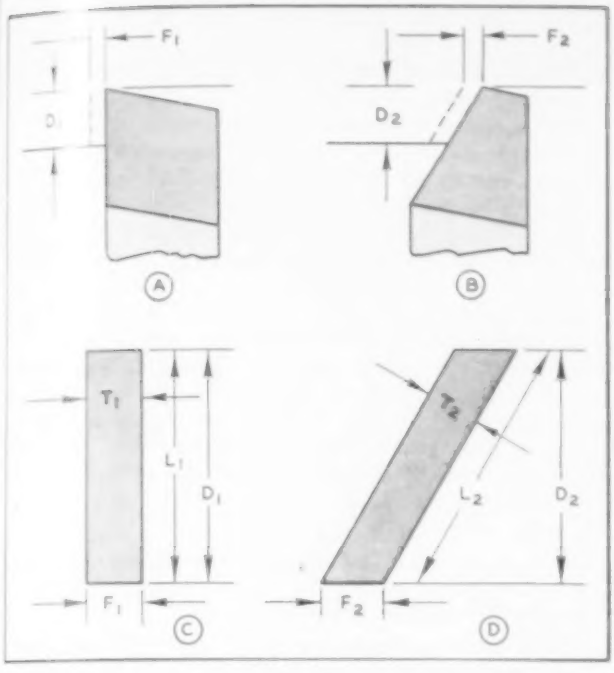


Fig. 8. Here are two tool designs, A and B. Both are cutting at the same feed and speed, but as can be seen below the chip formed at C is thicker than that at D.

repeat itself and as the frequency is increased chatter will result. It can be overcome by applying the side cutting edge at right angles to the axis of the work as shown at *B* in Fig. 12. In this case the force is directed parallel to the axis of the work by eliminating the cause of the chatter. The work will not spring away from the tool because the force against it is transmitted to the headstock center which will give a solid support. At *C* the side cutting edge is applied so that the force will cross the axis of work near the headstock center. The headstock center will give the work enough support to enable it to resist the pressure of the tool so as not to deflect and cause chatter. If a piece is held in a chuck and is unsupported at the outer end as at *A* in Fig. 11, it will be forced away from the tool and will cause chatter if it is stiff enough to spring back, or a taper will be the result of turning. The taper results from the work springing away more at the outer end than at the end supported by the chuck. Here again directing the force parallel to the axis of the work by changing the side cutting edge will improve the results obtained. The force exerted by the work against a boring bar as at *B* in Fig. 10 will push the boring bar away from the work, resulting in chatter or a bell mouthed hole. The principles just explained can be applied to boring bars in order to correct the difficulty described. Although in the case of an unsupported stub boring bar and effect of the forces at right angles to the face of the tool may cause it to deflect, the error due to the deflection in this direction usually is not great.

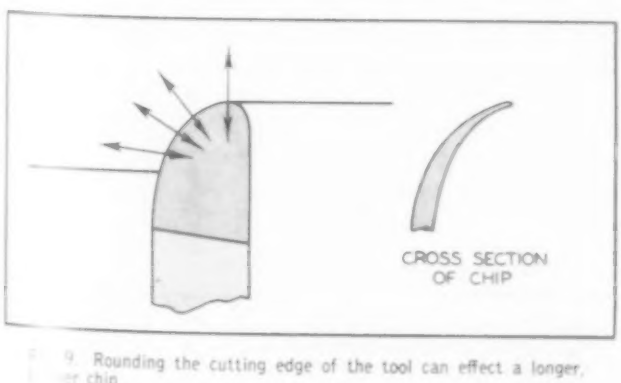


Fig. 9. Rounding the cutting edge of the tool can effect a longer, thinner chip.

It has already been pointed out that a cutting tool having its side cutting edge ground in the form of an arc as shown in Fig. 9 will cause further lengthening and thinning of the chip with the resultant improvements in the cutting action. Fig. 14 illustrates the manner in which the forces are directed with this type of cutting tool. It can be seen that the work must be rigidly supported in order to support the cutting forces applied by this tool. The forces applied by the nose of the tool are nearly perpendicular to the axis of the work. The action of these forces upon the work causes chatter or taper. However, the force has the least magnitude because at this point the chip will have its thinnest cross section. A cutting edge of this shape has great strength and ability to dissipate the heat from the critical cutting area. Such a cutting edge is useful when taking very heavy cut especially on shapers, planers, and boring mills where the work is usually rigid enough to withstand the forces applied by the cutting tool.

No hard, fast rule covering every situation can be given for the selection of the proper side cutting edge angle because conditions vary with each job. When turning a square shoulder, for instance, a 0 deg side cutting edge angle may be desirable for reasons of tool economy when regrinding, especially on multiple tool setups where the distance from the side of the tool to the nose is important.

End Cutting Edge Angle

The end cutting edge angle of single point tools which cut with their side cutting edge, is ground on the tool in order to allow the end cutting edge to clear the work. This angle should be kept as small as possible to support the nose of the tool and conduct the heat away from the critical cutting area. End cutting edge angles varying from 8 to 15 deg have been found to perform satisfactorily on most single point cutting tools. If this angle is less than 8 deg. it tends to flatten the nose of the tool and, therefore, to direct forces across the axis of the work increasing the tendency towards chatter. Increasing the end cutting edge angle to 20 deg decreases the tendency for the work to chatter. On automatic lathe operations where cam fed plunge cuts are used, the end cutting edge angle must be increased. For such applications the end cutting edge angle is made 8 deg. plus the cam or entry angle of the tool.

Single point tools are usually designed to cut with their side cutting edge. Cutting off tools and necking tools, however, utilize their end cutting edge in order to cut metal. With these tools the end cutting edge angle is usually made to a 0 deg angle. Cutting off tools are sometimes given a slight end cutting edge angle to prevent burr from adhering to the cut off part.

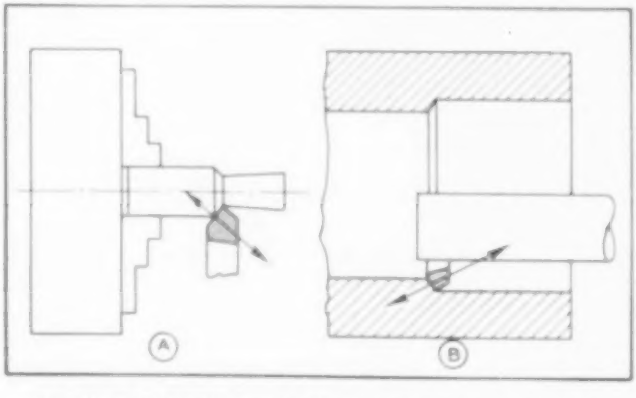


Fig. 10. A cutting tool exerts a horizontal force against the work as shown at A, and receives an equal force from the work, as shown at B.

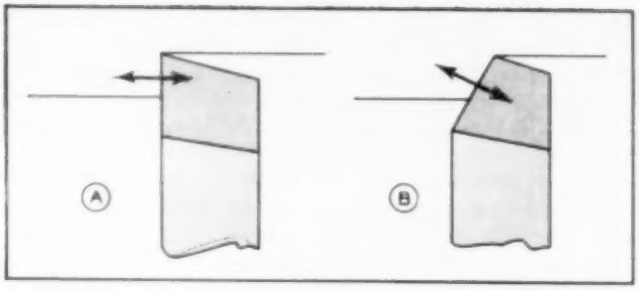


Fig. 11. Direction of the forces shown in Fig. 10 are illustrated here. Forces are as shown at A if the side cutting edge is at right angles to the work, and as at B if forces are at an angle to the work.

Finishing tools for machining cast iron on planers, shapers, and lathes are sometimes ground to cut on the end cutting edge as shown in Fig. 15. By utilizing a depth of cut approximately 0.003 to 0.008 in. and a feed almost equal to the width of the end cutting edge, a commercial finish can be produced with these tools. The advantage of this design is that the wide feed reduces tool wear which is especially important when cutting over a large surface area. This type of finishing tool is seldom used in recent years for turning steel. Its function has been largely supplanted by grinding and cemented carbide tools. However, an excellent finish can be produced with the tool when it is provided with a large back rake angle.

Tool Nose Design

The most critical part of the single point cutting tools is the nose. It is generally the weakest part of the tool and the part that is most prone to overheating because there is less metal present at this part of the tool to support the cutting edge and to dissipate the heat. The nose is actually an extension of the cutting edge. The effect of changing the form or contour of the nose will now be studied.

In some cases it is advantageous to grind the nose of the cutting tool to a sharp point as shown in Fig. 16. A tool having a nose ground in this manner will have the following cutting characteristics:

1. A decrease in the tendency towards chatter.
2. An inferior finish.
3. A slower speed and feed must be used.

A sharp pointed nose will direct the horizontal cutting forces parallel to the axis of the work when turning. Since these forces do not cross the axis of the work, the tendency towards chatter is greatly reduced. Work such as thin walled sections, and long slender pieces which have a great tendency towards chatter can often have any chatter present eliminated by grinding the nose of the cutting tool to a sharp point. However, a sharp pointed nose is not recommended for most classes of work. It will leave an inferior finish, except when an extremely slow feed is used, as it will literally cut threads into the work. This type of tool has the least strength to support the cut and the least amount of metal present at the critical cutting area to dissipate the heat generated by the cutting action. For these reasons a slower speed and a slower rate of feed must be used to prevent breakage of the nose and to prevent it becoming overheated and destroyed.

In most cases it is best to grind a radius on the nose of the tool as shown in Fig. 17. Such a tool will show the following cutting characteristics:

1. The tendency for chatter will be increased as the size of the radius is increased.
2. A better finish is usually produced when chatter is not present.
3. The speed and feed may be increased as the size of the radius is increased.

The rounded nose will direct the horizontal forces in a series of divergent rays as shown in Fig. 17. Most of these forces are directed across the axis of the work when turning. As the radius is made larger the magnitude of the total force across the axis of the work is increased thus increasing the tendency of the work to chatter. Decreasing the size of the radius of the nose of the cutting tool with a sharp point as the ultimate limit is one of the rules to follow for eliminating chatter. A combination of the correct nose radius and feed rate will produce a finish on the work that is acceptable for most commercial lathe, planer, or shaper work. The rounded

(Continued on page 38)

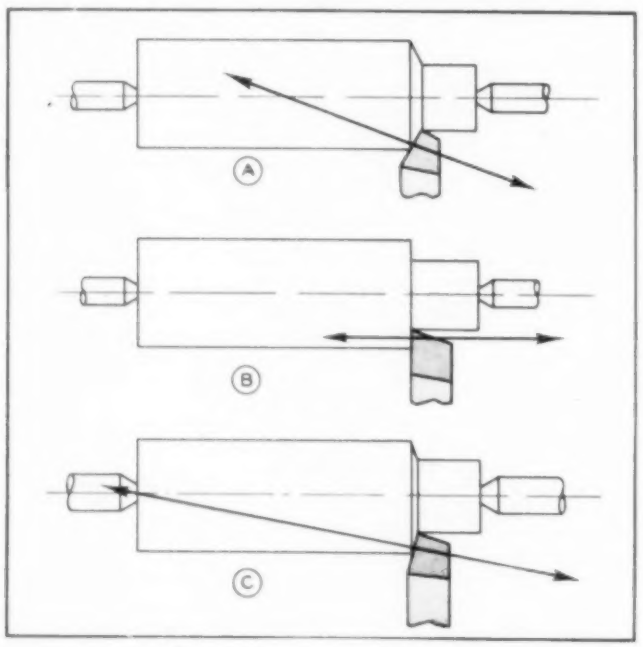


Fig. 12. If side cutting edge is applied as at A, forces eventually will effect chatter, which can be overcome by applying cutting edge as shown at B. Shown at C is application where force crosses axis of work near headstock center, and support is sufficient to prevent chatter.

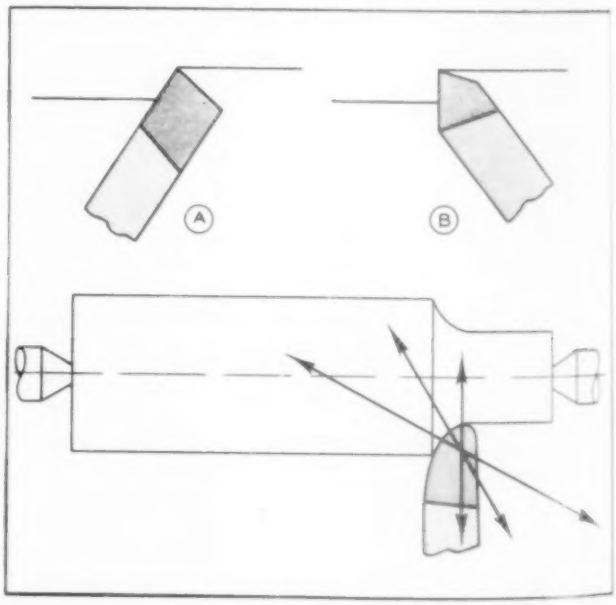


Fig. 13. (top). Application of the tool rather than the angle ground on the side cutting edge effects action, as shown by tool A, which has 0 deg side cutting edge angle. Fig. 14 (bottom) illustrates direction of forces when using arced cutting edge angle.

Simplifying Trigonometric Calculations

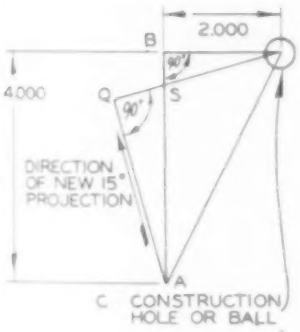
By F. N. LaMartine

WHEN DESIGNING or checking a jig or fixture for a simple or compound angle machining operation, a number of triangles must be solved to establish coordinate dimensions from a construction hole or ball as shown at point C in Fig. 1.

Illustrated in Fig. 1 are the usual trigonometric calculations needed for 15 deg coordinate dimensions. When a large number of these dimensions are needed for designing or checking a layout, the hypotenuse solution step of AC in Fig. 1 can be omitted. Fig. 2 shows the formula development and short-cut to the Fig. 1 values of QC and AQ, eliminating the AC hypotenuse solution.

Since the formula is now available and can be applied to all dimensioning problems of this type by substitution, it reduces the possibility of error when used as the original solution, as there is naturally less calculation.

Fig. 1



Given dimension BC = 2.000

Given dimension AB = 4.000

Find the new dimensions QC and AQ when a new 15° angular projection is made. Connect A to C to form the common hypotenuse.

Angle BAC = 26°33'54" = $\frac{2.000\ (BC)}{4.000\ (AB)}$ = .5000000 tan

Angle QAS = 15°00'00"

Sum angle QAC = 41°33'54"

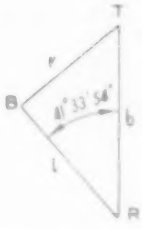
$$AC = 4.47214 = \frac{2.000\ (BC)}{.4472128\ (\sin 26°33'54")}$$

$$QC = 2.96712 = 4.47214\ (AC) \times .6634692\ (\sin 41°33'54")$$

$$AQ = 3.34607 = 4.47214\ (AC) \times .7482035\ (\cos 41°33'54")$$

For clarity to develop the following formula solutions, construct separate triangle RBT equal to triangle AQC used in the above solution. Thus in the following formula solution of triangles RBT and ABC the right angles, B and B are equal and also the hypotenuses b and b are equal.

Fig. 2



Sine Formula Development

$\frac{r}{b} = \text{Sin R}$ also, $\frac{a}{b} = \text{Sin A}$

$r = b \text{ Sin R}$ also, $a = b \text{ Sin A}$

$\frac{r}{\text{Sin R}} = b$ also, $\frac{a}{\text{Sin A}} = b$

Therefore: $\frac{r}{\text{Sin R}} = \frac{a}{\text{Sin A}}$

Thus formula, $r = \frac{a \text{ Sin R}}{\text{Sin A}}$

Cosine Formula Development

$\frac{t}{b} = \text{Cos R}$ also, $\frac{c}{b} = \text{Cos A}$

$t = b \text{ Cos R}$ also, $c = b \text{ Cos A}$

$\frac{t}{\text{Cos R}} = b$ also, $\frac{c}{\text{Cos A}} = b$

Therefore: $\frac{t}{\text{Cos R}} = \frac{c}{\text{Cos A}}$

Thus formula, $t = \frac{c \text{ Cos R}}{\text{Cos A}}$

Solution by formula with single operation of combined multiplication and division on calculator or slide rule

$$r = QC = 2.96712 = \frac{2.000 \times .6634692\ (\sin 41°33'54")}{.4472128\ (\sin 26°33'54")}$$

$$t = AQ = 3.34607 = \frac{4.000 \times .7482035\ (\cos 41°33'54")}{.8944276\ (\cos 26°33'54")}$$

Practical Application of Carbide Tools

By A. E. Rylander

Part II

THE ADAPTABILITY of the cutter previously discussed to other applications was further established in the case of a cumbersome weldment which required a pad to be milled, as shown in Fig. 7. Previously, this pad had been milled on an expensive vertical miller, with the cut on a straight line as suggested by line X—X. By using a negative rake cutter as described, and piloted as shown, the job was diverted to a drill press, releasing the miller for other essential work. There was some slight chatter, but no more than with the milling, while simpler handling and a single, downward pass of the drill press spindle cut production costs materially.

One application of carbide tooling which, at first, defied all efforts toward economical processing is shown in Fig. 8. The job entailed flash trimming of a weldment—also shown slightly camouflaged—while the welds were still at red heat. After various trials with single point tools, all of which broke down after trimming a few pieces, it was decided to broach the flash. Various tool materials were tried, with carbides showing the best results yet far below even the most reasonable expectations.

At first, steel-backed carbide inserts were set at right angles to the axis of the broach bars, with indifferent results, Changing to a 30 deg. angle upped tool life considerably, but as the angles were in the same direction side pressure tended to distort the still heat-plastic parts. This condition was improved by staggering each alternate tooth at a 30 deg. angle, the combination of shear-cut and carbide resulting in about an hour's run between grinds.

At this point, it was ascertained that a carbide grade had been developed especially suited to hot work such as described. This was tried out, with the result that the tools stood up for an entire shift of 4 hours. Tools were then changed between shifts, each shift starting with freshly sharpened broaches.

This job is described in detail for several reasons, not the least of which is the expectation of increased tool life as a result of resharpening before a tool breaks down. The economy of anticipating breakdown was well illustrated in the account of a tool control system recently brought out by Cross Company of Detroit and described in the Tools of Today section, June 1950 *The Tool Engineer*. In this system, the life of a tool between grinds is predetermined and its run is timed accordingly.

Too much stress cannot be placed on proper and timely resharpening of tools. By "timely" is meant resharpening before a tool becomes so dull that edges are broken down, necessitating considerable stock removal, whereas anticipation would only involve a few thousandths of an inch. Nor is grinding alone sufficient for maximum tool life. For optimum life and economy let alone quality of surface finish, cutting tools should be honed, lapped or superfinished after grinding. This applies equally to all cutting tools, whether carbide, cast alloy, or high speed steel.

Yet another "war baby" involved a cutting-off operation on an alloy steel forging which, as received, required removal of about 1¼ inch of stock from the ends. Facing would have entailed several passes, besides which the ends were so rough and irregular that the interruptions would have been severe regardless of the tool material used. As finally processed, the ends were cut off with a ¼ in. thick Tantung

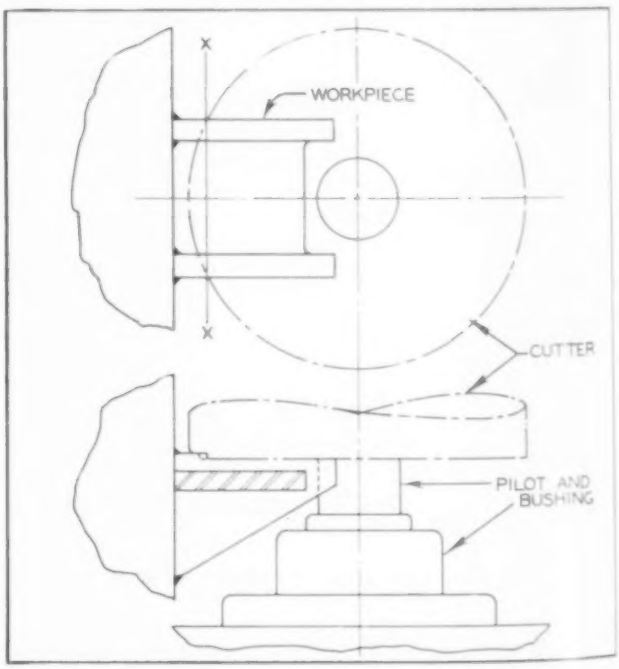


Fig. 7, showing a section of a large weldment which, among other operations, required facing of a fabricated pad. This pad was originally milled on a large milling machine, as indicated by line X—X. Later, it was diverted to a drill press and faced with a shear-cut cutter.

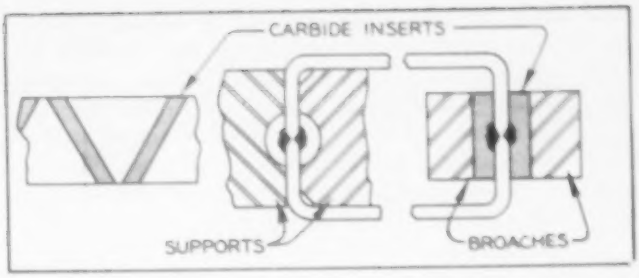
adequately supported and provided with a chip breaker — shown in Fig. 9. The tool, which has a slight side re— made a clean, straight cut through the 1¼ in. thick w— in less than 45 seconds. In this case, Tantung proved —be the best material for the job.

To a —nsiderable extent, conditions that must be met in turning and boring operations also apply to milling. That is, there must be rigidity in the machine and a commensurate rigidity of tool holders—in this case arbors and spindles —and work-holding fixtures. Wherever possible, cutting forces should be directed against the mass of the machine—say downward, against the miller table, or against solid stops on the fixtures. In some instances, workpieces may have to be redesigned to provide inherent "solidity" which, in turn, reduces chatter and vibration.

Highly favored by tool engineers and production executives is "in" or climb milling, as contrasted to conventional up milling. The latter tends to lift the work, with resultant chatter and vibration, whereas climb milling depresses the work so that, in many instances actual clamping is not necessary. In proof of this can be cited a demonstration of climb milling by an exhibitor at one of the recent ASTE tool shows, when shafts were literally thrown into magnetic V-blocks and large keyways cut at high surface speeds and coarse feeds, using carbide tools. See Fig. 10.

A number of conditions must be met for successful application of climb milling. For one thing, there must be inherent rigidity of the milling machine, and for another, backlash in feed screws or feed mechanisms must be reduced to the "irreducible minimum". The heavier the feed screws, to prevent spring, twist or bending, the surer the results. Also, large-diameter arbors are preferable to smaller, and cutters should be located as closely as possible to the machine column. In turn, the arbor should be supported close to the cutter by means of an outboard bearing, as suggested in Fig. 11.

Previously, a brief mention was made of vibration-dampening devices, particularly such as flywheel arbors. Used in connection with high surface speeds, these tend to maintain momentum, much after the manner that a flywheel on an engine maintains rotational speed between power strokes. Especially, they tend to reduce spring-back and chatter when milling interrupted surfaces or when coarse-tooth or fly cutters recurrently "cut air" and metal.



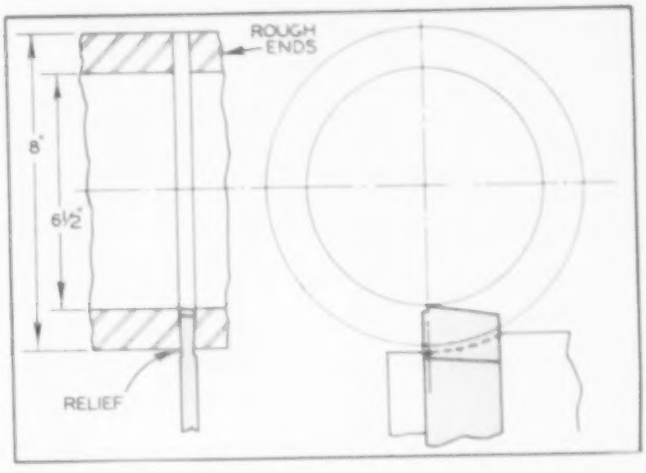
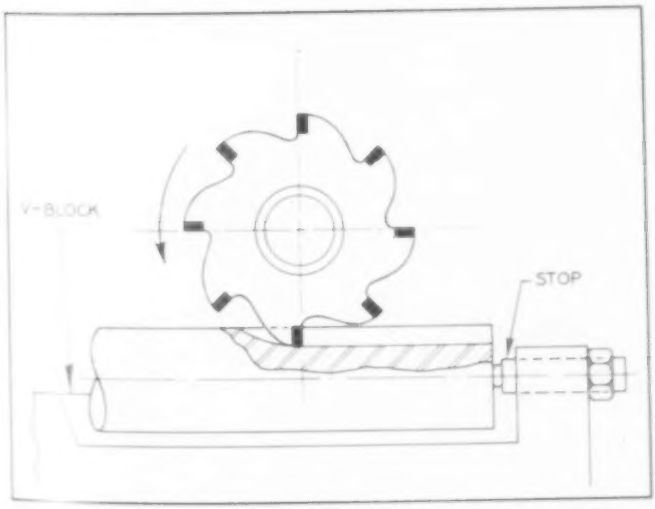
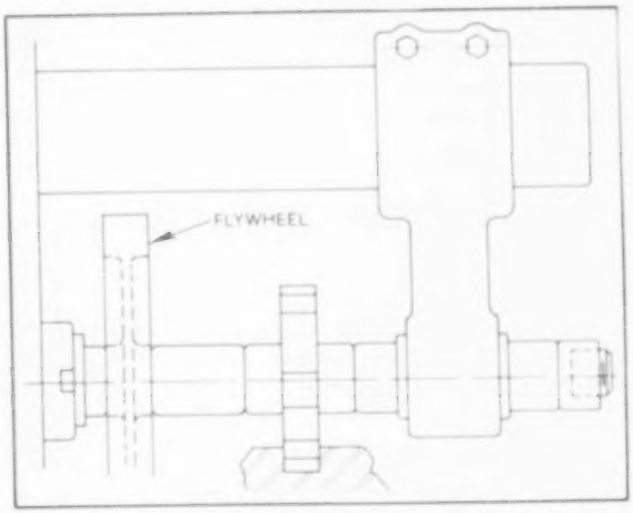


Fig. 8 (top), showing method of hot flash trimming of welded joints. Because the parts were trimmed immediately after welding, and were therefore heat-plastic, they were supported against cutter thrust. Actually, the trimming was done in two passes, first the outside, with the inside immediately following. A special grade of Carbide was used for the cutters, which were inset at alternate angles of 30 deg on a broaching bar. Despite high production, tool life was commensurately high, the broaches performing satisfactorily during an entire shift. Exchanged during the lunchtime shutdown, they required only nominal resharpening.

Fig. 9 (bottom), showing a section of an alloy steel forging which, as one of several operations, required removal of about 1¼ of stock from one end. As received, the ends were rough and wavy, presenting severe interruptions, and facing would not only have been destructive to tools but would have required recurrent passes. Tantung cut-off tools, ¼ in. thick as received and then relieved as shown and provided with chip breaker and adequately supported, cut through the 1¼ in. thick wall in about 45 seconds. A single pass with a facing tool then sufficed to square the ends to stated dimensions.



10 shows climb milling of keyways in a shaft held only in a magnetic Vee-block and against a stop, as demonstrated at a recent ASTE Tool Show. Climb milling tends to force the work downward against the mass of the machine table and eliminate tendency to lift with the cut, as in the case of up or conventional milling.



For all milling with carbide cutters, cutters should be held as closely to the machine column as possible. The cutter should be further supported with an outboard bearing, as suggested by Fig. 11. On interrupted cuts, or when using coarse-toothed or fly cutters, a flywheel on the arbor will tend to maintain peripheral momentum.

In milling, as with other methods of metal processing, shear-cut or negative rake often spells the difference between failure and success with carbide cutters. However, this statement should not be construed as a blanket recommendation of shear-cut since, as a matter of fact, its application is comparatively limited and confined to the more unusual conditions. The right type of cutter to use is the one best suited to the job in view.

In conclusion, it may be reiterated that this article is not written with the object of presenting the new, but to order recommendations for use of carbide tools which are broadly applicable to general practice. These recommendations may be summed up as follows:

(1) As far as they are available, use the most rugged and massive machine tools, preferably those specifically engineered for carbide tooling. (2) Incorporate "solidity" in work-holding fixtures, giving especial attention to rigid clamping and support under thin sections. (3) Provide rigid tool holders, with adequate support close to the cutting edge of the tools; particularly, provide ample support under carbide insets. In the case of inserted-blade milling cutters, the more "meat" in the body the better; however, the cutting tool industry can be trusted to meet that requirement.

(5) For materials being processed, use the grade of carbide recommended by the maker. (6) Last but not least, *keep carbide tools sharp*, and resharpen before actual breakdown of the cutting edges. Keep tools cool when grinding, to prevent checking, and for best results hone, lap or superfinish the cutting edges after grinding. If all of these conditions are met, as well as others mentioned in the body of the text and the captions, one may reasonably expect optimum performance and economy with carbide tools.

As a concluding note, however, one might add the basic truth that, to a considerable extent, the same recommendations that apply to carbides also apply to all cutting tool materials. Even before the advent of the carbides there was a definite trend toward more rigid machine tools, a trend which the carbides merely accelerated. At any rate, such factors as shear cut, proper tool sharpening, adequate rigidity of tools and work-holders, and proper use of coolants will up production regardless of whether one uses carbides, cast alloys or high speed steel.

Single Point Cutting Tools—Theory and Practice

(Continued from page 34)

nose is better supported and more able to dissipate the heat generated by the cutting action so that cutting speeds and feeds may be increased by increasing the radius of the nose.

Finishing tools are sometimes ground with a flat behind the nose of the tool as shown in Fig. 18. This flat is actually a part of the end cutting edge. For purposes of analysis, it may, however, be considered as a part of the nose here. The length of the flat may vary from 1/16 to 5/16 in., depending upon the size of the cutting tools, and the size and physical properties of the workpiece. The flat acts upon the work with a scraping action in order to produce the finish. Such tools will have the following cutting characteristics:

1. A great tendency to chatter is present unless the tool and the work are rigidly supported.

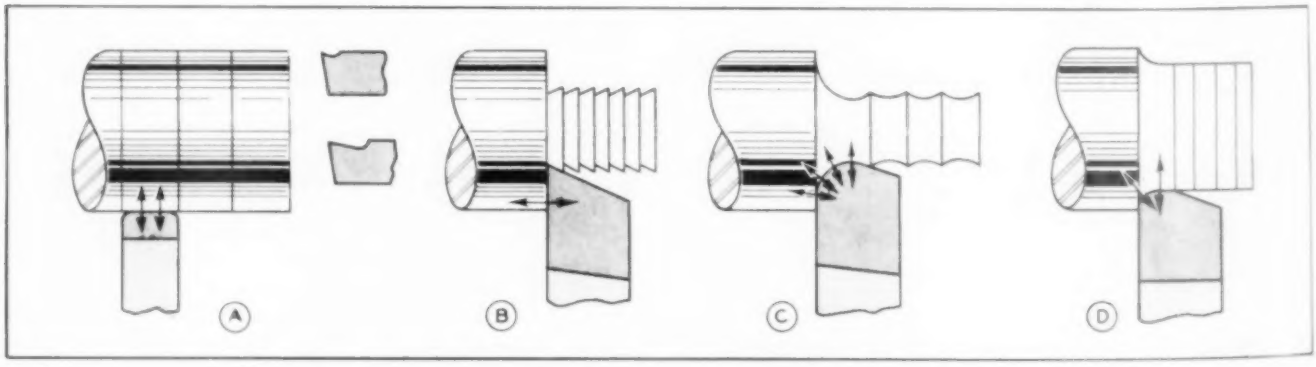
2. A good finish will be produced where chatter is not present.

3. The cutting speed, the feed, and the depth of cut are selected to suit the requirements of the job.

a. The flat is often applied when taking light finishing cuts only.

b. The flat is sometimes applied when taking a combined roughing and finishing cut.

It is evident from Fig. 18 that the application of the flat against the work when turning will cause forces to be directed across the axis of the work, the magnitude of these forces depending upon the speed, feed, depth of cut, and the width of the flat. If a finish is to be obtained on the work by the use of a flat, these factors must be balanced with the rigidity of the setup in order to avoid chatter. This can best be accomplished by experience under given conditions. The use of a flat to produce a good finish is especially useful when machining with high speed steel at what are now considered to be low cutting speeds. The elimination of the built-up edge by the use of high cutting speeds in conjunction with cemented carbide cutting tools has largely eliminated the necessity of obtaining a commercial finish on the work by using the scraping action of the flat.



Figs. 15, 16, 17 and 18 are shown here for convenience as A, B, C and D. Tool at A is ground to cut on the end cutting edge, for machining cast iron on planers. The tool at B (Fig. 16) has the nose ground to a sharp point, which offers mixed advantages. At C (Fig. 17) the radius on the tool nose offers better finish and speed than that at B. Tool at D (Fig. 18) has a flat ground behind the nose, which offers a good finish, but strong tendency to chatter.

Time Study As a Basic Tool

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Conclusion

THE RATE OR SPEED at which the operator is working is the most controversial in work measurement practice. All difficulties with standards tend to be related, with the error of measuring working speed by judgment, but careful analysis would indicate that the real cause for complaint in most cases could be related to faulty practice in steps 1 and 2.

There are two reasons why it is necessary to measure the working speed.

(a) **People vary in abilities and capacities.** Nature did not design all of us according to the same blueprints and specifications. Just what the ratio of outputs of the slowest worker on a job to the fastest worker would be if we timed a larger number of people qualified for the job and working at top speed, we cannot say because of limited data. Investigators of the subject have come up with ratios of 2 to 1 and greater. The important thing is not that any given ratio is correct but rather that the ratios proposed are of such an order as to emphasize the wide range in outputs we may get from two different people.

(b) **The performance of the same person might vary from day to day, from morning to evening, and from one week to another.**

Above we discussed the variation which arises from people being different. Here we wish to point out that any one person does not have a standard pace like that of a mechanical machine. There are an unlimited number of reasons why a person might work at one speed now and at another later. If we pick the "average operator" we must be sure that we set up specifications as to when the operator is average.

If it is agreed that evaluating working speed is necessary, the next problem is one of measuring it. To the tool engineer whose work revolves largely about precision measurement these basic steps should be rather clear. The mere fact that we are concerned with work measurement does not alter the fundamentals. In measuring the diameter of a shaft we use a micrometer, a man, and a gage block. In work measurement related to speed of motions we need a man and a "gage block." In each there appears a "gage block" since in measurement the value of the measurement in the first place depends on whether or not the measuring instrument is set precisely in terms of a commonly accepted standard.

During a time study the time study man compares the actual working pace of the operator with the concept of normal or standard pace which was established in his mind through training. He makes this measurement in terms of a scale. For example, if the scale used in the plant identifies the normal working pace as 100 percent, he estimates the operators' performance in terms of numbers above 100 if the performance is faster than normal and in numbers less than 100 if the performance is slower than normal. Thus, if the rating is 115 percent the time study man estimated the working pace as 15 percent faster than normal, and if 90 percent he felt the performance was 10 percent slower than normal. Since the working pace might vary from one element to another because of reasons within the control of the operator—or because of the nature of the work, it may be necessary to rate each element of the study. In other cases, because the job is being performed at uniform rate, rating each cycle of the study may be satisfactory. In Fig. 2 (shown in Part II) provision is made for either type of rating but rating factors are shown for elements only.

Step 5. Select elemental times.

Since our work measurement involves a series of time readings as indicated in Fig. 2, it is necessary to use some statistical means for arriving at one reading to represent the series of readings, recorded for each element. There are a few different methods used. The most common are the use of the arithmetic mean or average and the modal method. In the latter method the reading that appears most often is selected. The former is the most commonly used and the soundest. It recognizes all factors entering into the job. It is, of course, necessary to study readings which seem out of line with the rest of the readings. No such reading should be dropped from or included in the calculations except on the basis that a reason for its being out of line is stated on the time study sheet.

Step 6. Correct selected elemental time by applying rating factor.

Since our estimate of working speed is based on "normal pace" under certain specified conditions it is necessary to recognize the factors affecting the operator's pace which are different from the standard conditions of "normal pace."

FORM NO. 830

ELEMENTAL PRODUCTION STANDARDS

THE MURRAY CORPORATION OF AMERICA

Jan. 15, 1942 (DATE ISSUED)	OPERATION: Flange, or Flange and Pierce	23 (INDEX NO.)
Jan. 15, 1942 (EFFECTIVE)		1 (SHEET NO.)

PLANT NO. 4 DEPARTMENT NO. 33 CREW: Female—1

MATERIAL: Blanks—CRMR. GAUGE: 20 to 24

MATERIAL SIZE: 90 Square Inches Minimum—490 Square Inches Maximum.

METHODS:

EQUIPMENT: 941 Toledo, 95 or 96 Bliss Punch Press

APPLICATION PROCEDURE

The development of production standard hours for Flange, or Flange and Pierce operations is accomplished by the application of fixed and variable time factors to the formula provided here, based on engineering specifications pertaining to the job to be run.

The VARIABLE elements to be determined from the metal specification release for the part number involved, are as follows:

A. Time required to pick up part and position in die.
Based on sheet area—(Table No. 1)

B. Time required to remove part from die, turn, and reposition in press.
Based on sheet area—(Table No. 3)

C. Time required to remove part from die and place aside.
Based on sheet area—(Table No. 4)

X. Press revolutions per hour.

The FIXED or CONSTANT element characteristic to all flanging operations is:

R. Close and open clamps—(Table No. 2)

The FIXED element characteristic only to operations in which piercing occurs is:

S. Remove slugs from die—(Table No. 5).

These elements are expressed symbolically in the formula:

$$A + R + \frac{100}{X} + B + R + \frac{100}{X} + C + S = \text{Standard hours per "C" pieces.}$$

The following is an example of the use of the formula in establishing production standard hours for a flanging operation:

From the metal specification release—

1. Part number—M7384CK
2. Sheet area = 16½" x 21½" = 355 square inches.
3. Metal gauge = 22

From the machine specifications—

1. Stroke of press = 2500 revolutions per hour.

Substituting the proper values for the symbols in the equation:

$$.1346 + .039 + \frac{100}{2500} + .1035 + .039 + \frac{100}{2500} + .0977 = .4938 \text{ Standard hours per "C".}$$

Fig. 3. The application of standard data must follow certain established procedures in practice, since these data are based on standard practice. Procedure is shown above on a press operation involving feeding and presswork.

For example, a time study man may be trained to rate against a normal let us say of 3 miles per hour without load, dealing cards, light assembly or machine work, etc. What happens when the operator to be timed has to carry a casting weighing 20 lb. for a given distance? Since the time study man is trained for a no-load normal it is necessary for him to evaluate the speed in the same terms as if the operator had no load and then to correct for the effect of the load when he is making the calculations. This correction for effect of weight, control necessary, size and shape of part, etc. would call for much discussion but it is necessary to stop at this point and emphasize only the nature of the problem.

Step 7. Determine Allowance for job.

The term allowance is used to include many different things depending on the plant. We are going to define allowance as including only those additions of time to normal time to cover personal needs, minor delays, and the rest or fatigue allowance. There are many intermittent type elements such as replenishing stock at work place, tool grinding, machine resetting, inspecting every "nth" piece, etc., that are often referred to as allowances. These will not be so considered here but rather as intermittent type elements which deserve the same treatment and handling as repetitive type elements except that since they do not occur every cycle they must be prorated over the proper number of units. No such elements are shown in Fig. 2.

Personal allowance covers needs such as getting a drink of water and going to the lavatory. Minor delays allowance covers interruptions such as those caused by the foreman, maintenance man, inspector, and other interruptions caused by minor repairs and numerous short period delays falling into a chance-cause system. Fatigue allowance is an allowance which permits time for rest and recuperation from the effects of fatigue. The factors affecting the time for allowances are such that they do not occur regularly and therefore cannot be timed and included in the time study like repetitive type elements. It is necessary to make overall studies covering days and weeks to determine what factors should be included in the allowances and how much time for each.

Some companies express allowances in terms of percent, some in terms of minutes. Originally all allowances are in terms of minutes. Some companies find it desirable for convenience to change minutes allowance to percent allowance. If, for example, the allowances based on an 8-hour day were as follows: Personal 15 min.; Minor delays 12; Fatigue 33; the percent allowance would be

$$\frac{15 + 12 + 33}{480 - (15 + 12 + 33)} = \frac{60}{420} = 14.3 \text{ percent.}$$

Step 8. Add Allowance to Normal Time to Get Total Allowed Time for Each Element.

This step involves only a matter of calculation. If the allowances are handled in terms of percentage it is only necessary to multiply each elemental normal time by the figure one plus the allowance percentage in decimal form. In Fig. 2, for example, the normal time for an element No. 1 is .20 minute and the allowance is 15 percent. The allowed time for the element is .20 × 1.15 = .230.

Step 9. Add Allowed Times for Elements to Get Total Allowed Time for Job.

This step is one of pure addition. The result gives us the time allowed per unit. Using this figure the production per hour may be calculated or the time per unit may be multiplied by some figure such as one hundred or a thousand to give a more convenient figure to carry in various records. Fig. 2 illustrates these results.

Standard Data

The development and use of standard data rests upon the knowledge that jobs in total differ from each other but that they are composed of elements of work which are fundamentally the same. This is a parallel line of thinking to that which we have in the field of chemistry—where there is an infinite number of materials each of which can be analyzed ultimately in terms of the basic elements: oxygen, hydrogen, carbon, etc.

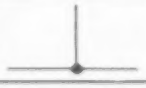
What the common elements of a certain class of work are requires a detailed study of many jobs. This is done by accumulating individual time studies. Data in this form are carefully analyzed and then summarized in some form as tables, charts, or formulae. The application of standard data must follow carefully established procedure since the data are based on certain standard conditions. Fig. 3 illustrates such an application procedure.

Standard data may be established in various degrees of refinement. In all cases the data arise from a collection of individual time studies. Many readers of this article will be aware of the fact that many companies are using standard data in the form of so-called "basic motion-time" standards. The basic idea is no different than that which has been described; the difference lies only in the fact that instead of establishing data for a compound such as "pick up part and position in die" we establish the data in terms of the elements of the compound; namely, reach for part, grasp, move to die, position, etc. It can be said with some assurance that the latter method is not only a practical one to use but that present trends indicate a very rapid future growth.

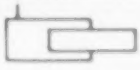
JIC Hydraulic Standards for Industrial Equipment

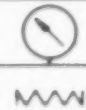
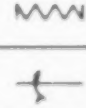
(Continued)

HI. 3 Standard Symbols—Shall be in accordance with the following recommendations. (Basic symbols can be combined in any form desired. No attempt is made to show all combinations.)

LINES	
LINE, WORKING	
LINE, PILOT (L>20W)	
LINE, DRAIN (L<5W)	
LINE, FLEXIBLE	
CONNECTOR (DOT TO BE 3 × WIDTH OF ASSOCIATED LINE)	
DIRECTION OF FLOW	
LINE, PASSING	
LINE, JOINING (TEE CROSS ETC) (DOT TO BE 3 × W)	
RESERVOIR (FLUID TANK)	
LINE, TO RESERVOIR ABOVE FLUID LEVEL	
BELOW FLUID LEVEL	
MANIFOLD, VENTED	
PLUG OR PLUGGED CONNECTION	
TESTING STATION (GAGE CONNECTION)	
POWER TAKE-OFF	
RESTRICTION, CHOKE, FIXED VISCOUS	
RESTRICTION, ORIFICE, FIXED NON-VISCOUS	

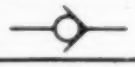
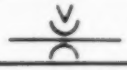
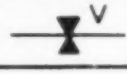
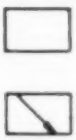
PUMPS	
PUMP, SINGLE FIXED DISPLACEMENT	
PUMP, SINGLE VARIABLE DISPLACEMENT	

MOTORS AND CYLINDERS	
MOTOR, ROTARY FIXED DISPLACEMENT	
MOTOR, ROTARY VARIABLE DISPLACEMENT	
MOTOR, OSCILLATING	
CYLINDER, SINGLE ACTING PLUNGER TYPE	
PISTON TYPE	
CYLINDER, DOUBLE ACTING SINGLE END ROD	
DOUBLE END ROD	

MISCELLANEOUS UNITS	
MOTOR, DRIVE, ELECTRIC	
HEAT EXCHANGER	
INTENSIFIER	
ACCUMULATOR	
FILTER	
STRAINER	
PRESSURE SWITCH	
PRESSURE GAGE	
SPRING	
SHAFT, ROTATING	
COMPONENT ENCLOSURE	

JIC Hydraulic Standards for Industrial Equipment

(Continued)

VALVE	
VALVE, CHECK	
VALVE, RESTRICTION, CHOKE VARIABLE VISCOUS	
VALVE, RESTRICTION, ORIFICE VARIABLE NON-VISCOUS	
VALVE, BASIC SYMBOL (INSERT MODEL NO. FOR SPECIAL VALVES) METHOD OF INDICATING INTERNAL FLOW	
VALVE EXAMPLES	
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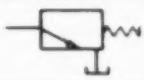
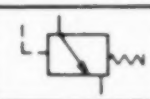
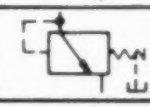
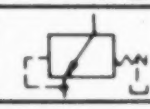
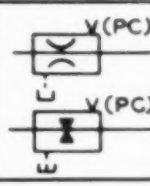
VALVE, MAXIMUM PRESSURE	
VALVE, RELIEF REMOTELY OPERATED	
VALVE, SEQUENCE DIRECTLY OPERATED	
VALVE, PRESSURE REDUCING	
VALVE, FLOW CONTROL PRESSURE COMPENSATED VISCOUS NON-VISCOUS	
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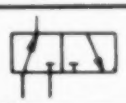
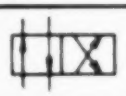
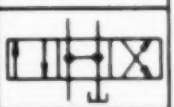
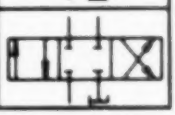
VALVE, DIRECTIONAL 2 POSITION-3 CONNECTION	
VALVE, DIRECTIONAL 2 POSITION-4 CONNECTION	
VALVE, DIRECTIONAL 3 POSITION-4 CONNECTION OPEN CENTER	
VALVE, DIRECTIONAL 3 POSITION-4 CONNECTION CLOSED CENTER	

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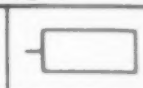
CONTROL, BASIC SYMBOL	
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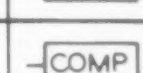
CONTROL, COMPENSATOR	
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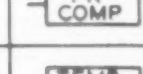
CONTROL, COMPENSATOR TEMPERATURE	
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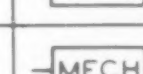
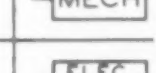
CONTROL, MOTOR ELECTRIC	
CONTROL, MOTOR HYDRAULIC	
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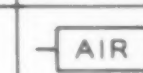
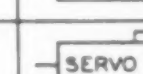
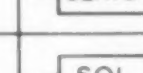
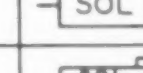
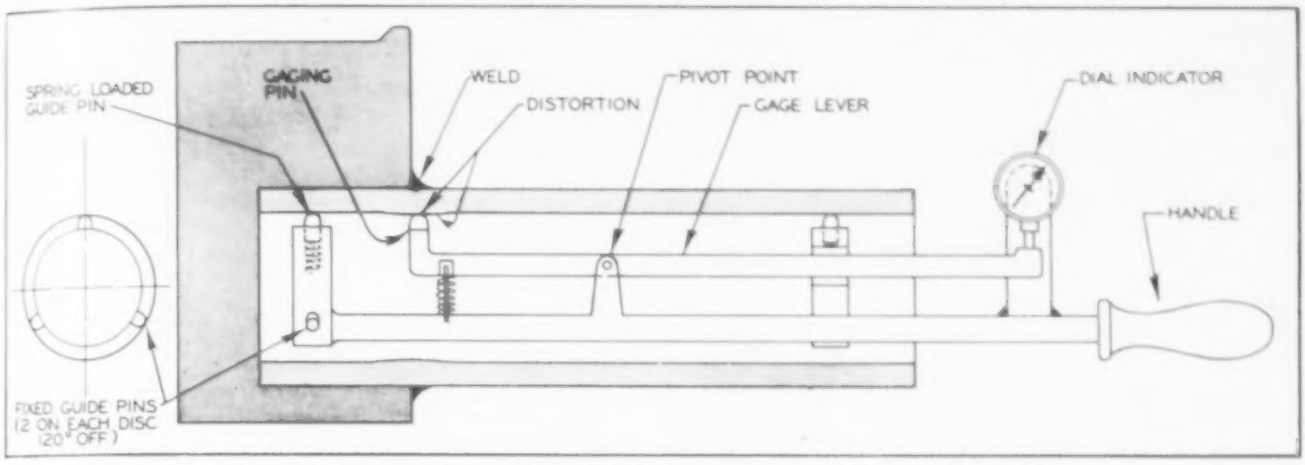
CONTROL, SOLENOID	
CONTROL, SOLENOID HYD. PILOT OPERATED	
CONTROL, THERMAL	
CONTROL, PILOT HYD. DIFFERENTIAL AREA	

GADGETS

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Dial Gage Speeds Inspection of Weldments



A bore gage, such as shown here in principle, simplifies gaging of cylinder bores distorted by welding.

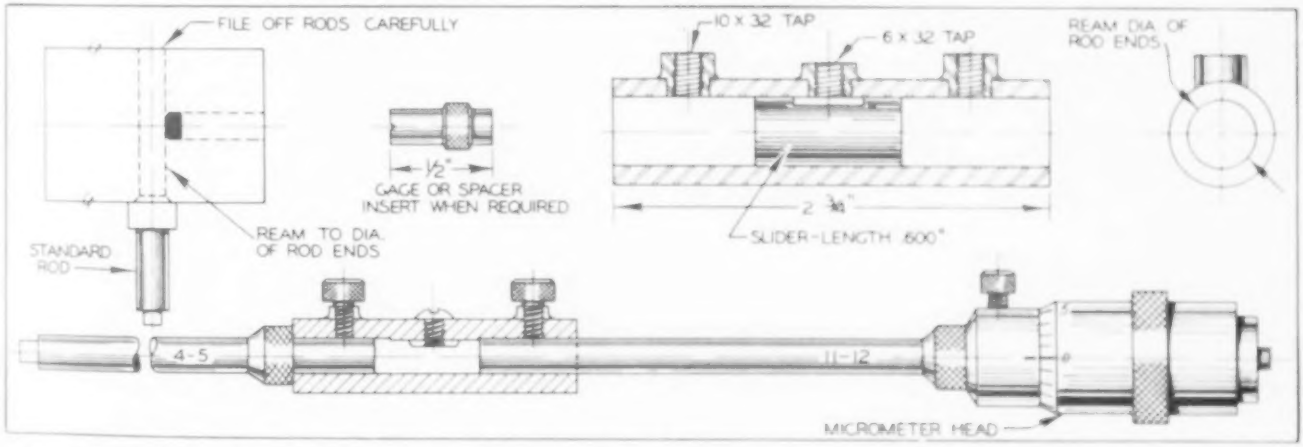
When welding a number of finished, honed cylinders into steel housings, the inside walls of the cylinders distorted slightly opposite the weld locations, thereby making the inside diameters smaller at these points. A certain amount of reduction of diameter did not matter but since the sizes varied considerably, an accurate method of checking had to be devised to determine which assemblies were to be re-honed.

The gage illustrated, which is here shown in principle, consists of a light-weight weldment made by welding two steel disks to a handle and body bar. The disks are machined to receive three pins each, spaced 120 deg. apart. Two pins are stationary, while the third is spring-loaded to force the gaging mechanism against the stationary ones.

The disks are also provided with a milled slot each to act as bearings for the gage lever, which is hinged at a pivot point at such distance to make the dial indicator read twice the initial impulse. With this gage, it is a matter of seconds to determine the reduction of diameter of the cylinder bore near the outside weld.

H. G. Frommer
Milwaukee, Wis.

Extension for Inside Micrometer



Shown at upper left is a tool steel block, reamed to take the shank ends of the standard measuring rods. After hardening to resist filing, it was ground to 1.000 in. high, faces parallel. A slight countersink serves for dirt clearance. A sleeve and a spacer—or sliding plug—is made as shown at upper right, the two being assembled with a standard micrometer head and rods, as shown below, to extend range from 12 in. to 22 in. Example, by using rods 10-12 and 10-11, and micrometer head set at zero, 21 in. is obtained. By inserting ½ in. sleeve and head set at 0.500, 22 in. is obtained.

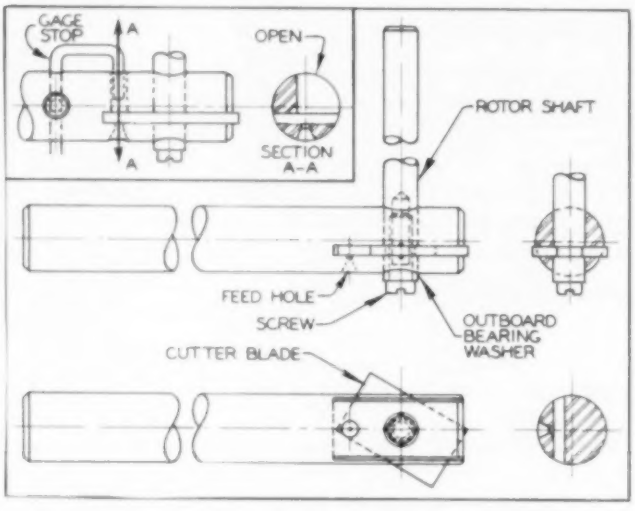
A set of inside "mikes" of a well-known make consisted of 10 rods and one ½ gage for 2 to 12 in. measurement. Finding that the 2 to 12 in. range was often not long enough, the writer made up an extension, as illustrated, to increase the range from 12 to 22 in. Any of the 10 rods can be used as occasions require.

A tool steel block was made, as shown at A, and after hardening was ground parallel exactly 1.000 in. high. All rods were then inserted in this block and the shank ends filed flush, making all equal in length. A sleeve was then made, as indicated by B, also, a spacer or sliding plug as shown by C. By using two rods of required length, connected by the sleeve, increments from 12 to 22 can be obtained, as shown by sketch D.

Charles G. Spicer
Grand River Valley Chapter

Low Cost Wire Cut-off

For cutting off short lengths of solder or brazing rod in production quantities, the tool illustrated combines the efficiency of a high priced automatic cut-off machine at a cost little more than that of a pair of cutting pliers. Its usefulness is limited only to the proportional length of the slug in relation to wire diameter, and also by the design of individual tools. Despite its simplicity, the percentage of return by this tool in relation to original method has been so marked that the basic design puts it high in the list of low-cost high-production tools.



Short lengths of solder, welding rod or wire may be cut off at high speed and with consistent lengths on this simple cutoff tool.

While the sketch is somewhat self-explanatory, a few items of constructions and operations may be discussed. The body is a length of tool steel bar, turned to $\frac{3}{4}$ in. diameter. The milled slot is cut to a width equal to the length of the slug to be cut off. A cross hole is reamed slip fit for a $\frac{3}{8}$ in. dia. drill rod rotor shaft, and a reamed hole, the size of the wire to be cut off, is drilled and countersunk for lead-in about 9/16 in. from the $\frac{3}{8}$ in. hole. A small channel, on either side of the slot, serves for lubrication of the rotor shaft.

The rotor shaft has a square milled on one end, its length slightly less than the width of the blade to provide for clamping, and is tapped 10-24 thread. The blade, of flat tool steel ground to fit the slot in the body, is $\frac{3}{4}$ wide x $1\frac{1}{4}$ in. long, and has a centrally located square hole, snug fit on the square end of the rotor shaft. An outboard washer, the same diameter as the rotor shaft, locks the blade in place and completes the assembly. Naturally, some care is required to keep all components in alignment and free running. The blade is hardened, as is the seated end of the body.

To operate, chuck the rotor shaft in the spring collet of a lathe and allow the body—or stator bar—to rest on the lathe bed and inside a tray so as to catch the slugs as they fly out of the slot. With the lathe running, feed the wire into the feed hole with a constant pressure so as to move it against the solid stop of the slot as soon as the cutter has passed the feed hole. A trial run or two will determine the correct lathe speed that will insure an even length of slug.

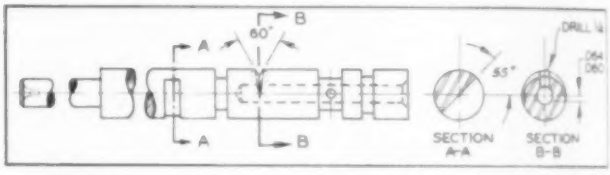
A modification of the original tool—which is shown in the photograph—is shown in the inset. The principle is the same; the only difference being that a slot has been cut in the stator bar, behind the cutter slot, and a stop gage now permits adjustment for various lengths of slugs. Production of this tool runs into thousands per minute, or as fast as the operator can feed the wire. The tool may be used in the drill press as well, although problem of feeding and catching the slug is somewhat aggravated. In any event, slug cut-off surpasses any hand operation for quality of break, equality of length and output per hour.

Below, a photograph of the original tool.

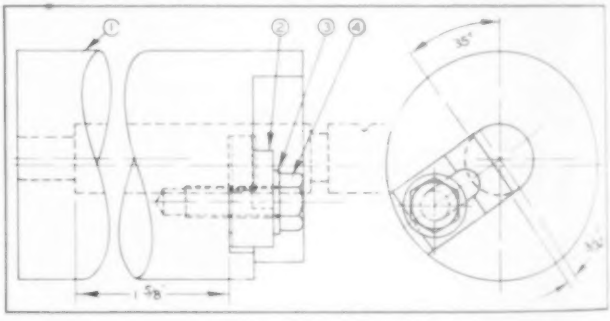
Arthur Christensen
Lockport, N. Y.

Simple Eccentric Grinding Fixture

An interesting eccentric fixture is used by Norton Company, Worcester, Mass., to grind an eccentric 60 deg. notch in the metering spindle used on the control valve for Norton surface grinders. See Fig. 1, in which all other dimensions have been deleted. The notch is ground as one of the final operations.



A simple eccentric fixture provides for grinding a V-notch in a precision control valve component. Fig. 1 above; Fig. 2 below



The fixture shown in Fig. 2 is made with a machine steel body 3 in. long, heat treated. A hole, 0.641 in. in diameter and 0.062 in. off center, is honed in this body. This is the amount of eccentricity of the notch in the workpiece, shown as section B-B on the part drawing. A flat, $\frac{7}{16}$ in. deep, $\frac{3}{32}$ in. off center and at an angle of 35 deg. to the vertical center line, is then milled in the body. This corresponds to the 55 deg. cut in the part, shown at section AA. A slot, at right angles to the 55 deg. flat is next milled in the body, same width as the $\frac{7}{16}$ normal diameter bore. A sliding locator clamp is fitted into this slot.

In use, the fixture is chucked in the head of the grinder, the part loaded into the bore, and positioned by the clamp bearing against the 55 deg. cut, which determines angularity of the V-notch. Grinding is then done with a V-shaped wheel, feeding in until the V-notch is at correct depth and angularity. The fixture, which is simple and well designed, permits accurate duplication with quick loading and unloading.

Robert Mar...
Providence, R. I.

Left: President H. L. Tigges (left) swears in F. J. Schmitt, B. J. Hazewinkel and J. P. Crosby as new directors. Right: R. F. Waindle, third vice-president, presides as committees under his direction present their reports. Seated, from left: T. J. Donovan, Jr., director; G. A. Goodwin, treasurer; H. E. Conrad, executive secretary.

A. S. T. E. NEWS
Doris B. Pratt, Editor

Technical Advances Mark First Half of Society's 1950-51 Year

Board Approves Research, Book, Standards Projects, Adopts New Budget at Semi-Annual Meeting in Detroit

IN THE FIRST six months of the 1950-51 year, ASTE national committees have planned or initiated the publication of a new technical manual, an organization structure for tool engineering research, cooperation with an important industry standards group, and a face lifting for *The Tool Engineer*.

They will encourage professional progress with engineering scholarships, member technical writing with medal awards. They hope to foster a closer-knit organization through regional meetings, and will recognize outstanding contributions to chapter growth by awarding a distinctive emblem.

These and other accomplishments and proposals were laid before the board of directors at the Society's semi-annual meeting, October 20, in the new and debt-free Detroit headquarters building.

A sound financial position and careful management by their predecessors enabled the directors to grant appropriations where needed for these undertakings and still keep the new budget below the previous fiscal year's.

As board chairman, President Herbert L. Tigges conducted the meeting and installed three directors-elect (reported in the November issue).

A brief digest of committee reports and board actions follows:

Tool Engineering Research

Diligent investigation into the organization and operation of research groups was reflected in the detailed report of A. M. Sargent, chairman of the Tool Engineering Research Fund Committee.

If solicited and endowed funds are to receive the protection their donors would expect, an amendment to the constitution is necessary, Chairman Sargent explained. This amendment would separate such funds, both from Society and outside sources, from the property of the organization.

Members of the committee would be trustees of the fund and autonomous in its administration. The directors would retain control of committee appointments only.

An officers' recommendation that the committee's operating expenses be a So-

Below, left: During a brief recess in the board meeting President Tigges confers with J. J. Demuth (center), first vice-president, and W. B. McClellan, secretary. Center: Mr. Demuth asks a committee chairman in his charge to answer a director's question. At his left are H. E. Collins, second vice-president, and W. A. Thomas, assistant secretary-treasurer. Right: This group pauses for a bit of shop talk on their way to lunch. From left: V. H. Ericson, J. P. Crosby, B. J. Hazewinkel and T. J. Donovan, Jr., directors; J. N. Edmondson, education chairman; A. D. Lewis, director, and H. C. McMillen, finance chairman.

ciety budget item was carefully weighed before the directors authorized the committee to draft the requested amendment for ultimate submission to the members.

* * *

Education

Through a member serving on the Research Fund Committee, the Education Committee will act as advisor in the research activity.

In order to develop tool engineering degree curricula, Chairman Jay N. Edmondson stated, ASTE needs industry's cooperation in demanding that colleges and universities supply men trained in this field.

Requests from technical institutes for approval of curricula are handled through the Engineers' Council for Professional Development, he reported.

The first "American Society of Tool Engineers National Scholarship Awards" were instituted when the directors approved an appropriation for five $300 scholarships.

* * *

Handbook

Success of the "Tool Engineers Handbook" has encouraged the Handbook Committee to consider publishing another technical manual. In the first 13 months since publication nearly 20,000 Handbooks have been sold.

Royalties and discounts on sales have returned about 40 percent of the Society's outlay.

To meet book trade demand the publisher has been authorized to sponsor sectional publication of the Handbook, beginning with three selected booklets of 150-200 pages each.

His committee, Chairman E. W. Ernst reported, is now surveying members and industry on information desired and is developing sources of material for a revision, to be issued within the next six years.

The publisher urges the Society to produce other books of comparable quality. A die design manual is one project suggested.

The directors accepted the national officers' recommendation that the committee name be changed to "Book Committee," a policy-making group responsible to the president. The committee was directed to proceed simultaneously with a Handbook revision and a die design manual.

* * *

Standards

Current major activity of the Standards Committee is the B-52 Classification of Materials for Tools, Fixtures and Gages, for ASA standardization. Tool steels and other steels are the first materials to be studied, with five sub-committees at work on this project.

The Joint Industry Conference has invited the committee to appoint top-flight men from engineering-management to serve as observers and liaison on several JIC committees. NSC requested the directors' recommendations for appointments.

The board was also asked to approve financial cooperation with ASA and its other affiliated organizations in sponsoring the 1952 general assembly of the 30 member countries of the International Standards Association in the United States.

After discussion of these and other NSC operations reported by Chairman L. B. Bellamy, the board voted approval of and cooperation with the extensive program.

* * *

Constitution and By-Laws

A simplified legal structure will emerge when the Constitution and By-Laws Committee completes its thorough overhauling of Society law and procedures, eliminating conflicts, duplication and obsolescence.

D. R. Linch, chairman, expects to have the revision ready for the 1951 annual meeting.

The board indicated readiness to review this streamlined legislation when it is presented. They instructed Mr. Linch's committee to process a proposed constitutional amendment, permitting the Society's projected research program to function, together with accumulated petitions for other changes.

* * *

In compliance with a president's directive, endorsed by the other national officers, the Program Committee has doubled the number of technical sessions originally planned for the 1951 annual meeting in New York.

Program

A feature of this meeting, Chairman G. A. Rogers informed the board, is the presentation of written discussions of technical papers. The committee recommended its continuance as program policy, along with the publication of all convention papers.

In acting on this report the board adopted an officers' amendment that a series of regional meetings proposed by the committee be initiated in two chapter cities. Introduced on an experimental basis, such gatherings may replace semi-annual membership meetings.

* * *

Membership

ASTE membership continues to reach into new areas. H. B. Osborn, membership chairman, expects to have a group at Garden City, Long Island, N. Y. ready for chartering early next year.

Rising operating costs necessitate greater activity in building membership, in order to maintain present services at the same dues level, according to Mr. Osborn. For the member making the greatest contribution to his chapter, the committee will sponsor an annual chairman's award pin.

* * *

Largely composed of professional writers, the Public Relations Committee offers to prepare publicity material to assist chapters in promoting their programs.

Top: Immediate Past President R. B. Douglas shows Mrs. Douglas through the new ASTE building. Below G. A. Rogers, program chairman, tells the board his committee is scheduling 30 technical sessions for the New York annual meeting. At left and right: D. R. Linch, constitution and by-laws chairman, and H. B. Osborn, membership chairman.

Members of the Honor Awards Committee draft a procedure for making awards for outstanding technical papers. From right: R. H. Morris, F. W. Curtis, F. A. Shuler, W. F. Wagner, O. W. Winter and W. H. Smila, chairman, all past presidents. At extreme left S. F. Girard of the headquarters staff takes minutes of meeting.

Chairman W. G. Ehrhardt also invited chapter membership, program and public relations men to call upon the committee to draft letters informing top management of the Society's aims and functions.

Public Relations

Machinery has now been set up, Mr. Ehrhardt stated, for giving wider publicity to coming meetings through the trade press. Chapters are urged to submit announcements approximately two months in advance to meet deadlines.

* * *

Outstanding physical improvements in *The Tool Engineer*, beginning with the next issue, were promised by the Editorial Committee.

Chairman W. F. Sherman reported that his committee had been working with the magazine staff on maintaining an editorial backlog and planning future issues. Long term problems, handling of convention papers, and ways of increasing reader interest also are being considered.

Editorial

* * *

W. H. Smila, chairman of the Honor Awards Committee, has appointed Ray H. Morris to head a sub-committee to draw up a procedure for handling the Lincoln Memorial medals and similar awards.

Honor Awards

This group met the day after the board meeting to work on their assignment.

* * *

Arrangements are well under way for the 1952 industrial exposition at Chicago, Executive Secretary H. E. Conrad told the board. Ample facilities have been reserved for exhibits and meetings, as well as accommodations for visitors.

Executive Secretary

Field service to chapters has been extended to include traveling representatives of *The Tool Engineer*. They, along with headquarters staff members, contact local officers and attend chapter meetings in their territories.

All indebtedness for the new headquarters building has been wiped out within two years of its erection, Mr. Conrad added.

* * *

The Society ended its fiscal year well within the budget, Finance Chairman H. C. McMillen announced.

Outlay for service and projects recommended by his committee for 1950-51 was $173,322. Insofar as Society funds permitted and committee programs merited, the Finance Committee endeavored to adhere to budget requests.

Finance

The figure finally approved by the board is $179,198, slightly under the previous year's appropriations. This includes budget items arising since the committee submitted its report.

* * *

Prestige acquired through technical book publishing and exposition activities has been accompanied by financial gains, Treasurer G. A. Goodwin's report shows.

While the present net worth of over $350,000 will be somewhat depleted at the end of this "off-show" year, the organization has substantial reserves and a high ratio of assets to liabilities.

Treasurer

Clouding this bright picture are unsettled world conditions and their possible effect on Society finances. During the meeting the directors studied a presentation on Society functions in a national emergency, and means of retrenchment if income were sharply reduced.

* * *

Since their election in April, the national officers have met several times to work on specific projects, determine policy, and plan future activities.

In September, Secretary W. B. McClellan reported, they reviewed the semi-annual reports and the proposed budget, making recommendations to guide the directors.

Secretary

* * *

Mr. McClellan also read petitions submitted in the April house of delegates by Greater New York and Boston chapters, concerning revision of age limits for student membership and requirements for junior membership.

House of Delegates

The directors instructed the constitution and by-laws chairman to prepare a constitutional amendment for action.

* * *

Vice-Presidents J. J. Demuth and R. F. Waindle presided during discussion of reports of committees under their jurisdiction. At the request of H. E. Collins, just returned from a five-months' business trip abroad, President Tigges took the chair while reports of committees supervised by the second vice-president were considered.

Others answering Secretary McClellan's roll call were: W. A. Thomas, assistant secretary-treasurer; J. P. Crosby, T. J. Donovan, Jr., R. B. Douglas, V. H. Ericson, B. J. Hazewinkel, A. D. Lewis, L. B. Bellamy and F. J. Schmitt, directors. R. I. Robbins, professional engineering chairman; Mr. Smila, Mr. Sherman and Mr. Ernst were unable to be present.

At the close of the meeting the officers, directors and committee chairmen adjourned to the Statler Hotel for dinner and an informal speaking program.

Opens Consulting Service

Boston, Mass.—F. Wesley Smith, professional engineer, has opened a consulting office at 173 Hollis St., Holliston.

Until recently Mr. Smith was New England manager for the D. A. Stuart Oil Co. He is a Boston ASTE member.

NPA Consults Tigges About Defense Tooling

Washington, D. C.—For the past several weeks H. L. Tigges, ASTE president, has been spending two days a week in Washington at the request of the National Production Authority, to advise and consult on problems of the machine tool industry.

H. L. Tigges

As the defense program gathers momentum, NPA is faced with the difficult assignment of trying to maintain a civilian economy while promoting rearmament. In considering material conservation and allotment, the importance and priority of machine tools are recognized.

Indications are that Mr. Tigges will serve as advisor and consultant to NPA. Previously he has had no official status with the war production agency.

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Chapter listings include member news.

Madison chapter is host to University of Wisconsin engineering students and their professors. From left, standing: E. C. Helmke, chapter secretary; Fred Lowe, program chairman; C. A. Gilpin, associate professor of mechanical engineering; Student Olson, E. J. Dosing, mechanical engineering instructor; W. R. Carnes, chapter chairman; J. D. Holly, third vice-chairman; J. W. Watson, associate professor of electrical engineering; A. C. Hoffer, chapter first vice-chairman, and L. J. Henry, education chairman. Seated: A. F. Griswold and B. B. Bridge, mechanical engineering instructors; and Students Tessmer, Kjell and Schroeder.

P. E. Officer Outlines Ontario Requirements

Hamilton, Ont.—Hamilton chapter had a representative of the Ontario Professional Engineers Association as guest speaker at a dinner meeting in October. Lieutenant Colonel T. M. Midland, executive secretary of that organization, discussed "Why a Profession?"

The colonel opened his talk by harking back to the days when an engineer's head literally "rolled" as a consequence of mistakes. As pioneers in more modern times, the speaker cited the blind civil engineer, Metcalf, and James Wall in the mechanical engineering field.

Registration Requirements Stiffen

Since the first Ontario legislation in 1902, Colonel Midland pointed out, requirements for professional standing have become increasingly exacting. At present a successful candidate must:

(a) Have an engineering degree from a recognized university, plus five years' practical experience. To be recognized, a university must have its engineering curriculum approved by the Professional Engineers Association. Credit for four years' practical experience is granted when the engineering course includes field work.

(b) (For those without full university standing.) Pass a series of examinations approved and presented by the Association.

A new syllabus outlining examination requirements was recently issued to the membership by the chapter Education Committee. With this syllabus as a guide, the committee is working with the extension department of McMaster University to set up a series of lectures to prepare ASTE members for the Professional Engineers examination.

Professor Sterm, head of the university's extention department, was a guest.

Attendance at the dinner exceeded 100 and included delegations from Toronto, Niagara District, and Grand River Valley chapters.

Madison Entertains U. W. Students and Professors

Madison, Wis.—Tool engineering students and their instructors at the University of Wisconsin were guests of Madison chapter at a dinner meeting, held October 10 at the Ace of Clubs.

Prof. C. H. Sorum, U. W. specialist on colloidal chemistry, was the speaker of the evening. He addressed the members and guests on the subject, "Atomic Energy." W. R. Carnes, chairman, presided at the meeting.

This year, L. J. Henry, education chairman, announced, his committee plans to offer scholarships to deserving students at the university level.

The chapter keeps in close contact with tool engineering courses offered at the university and is active in inviting students and faculty to ASTE membership.

Must Seek Spiritual Aid To Perform Task Ahead

Pittsburgh, Pa.—"America, 1951 Model" was blueprinted for Pittsburgh chapter in a dynamic address by James Y. Scott, president of the Van Norman Machine Co., Springfield, Mass. Mr. Scott spoke at a dinner meeting of more than 100 members and guests, held October 6 at Hotel Sheraton.

Peace, he said, has only been possible when the strongest military nation has wanted it. We need a vast number of young men well trained for military service. The remaining civilian population must produce enough goods for normal living, plus an increasing amount of defense equipment.

Finally, Mr. Scott declared, we must seek spiritual uplift through the faith and humility that characterized our forefathers.

W. B. Peirce, a past president of the Society, introduced Mr. Scott. G. C. Wood, chairman, presided and Elwood Weissert, membership chairman, reported on his committee's activity.

Nearly 600 Detroiters Visit Kettering Plant

Detroit, Mich.—The Kettering engine plant of the Oldsmobile Div. General Motors Corp., was inspected by 5?? members of Detroit chapter early this fall.

Nearly 500 of those who made the trip to Lansing by chartered buses and private automobiles were dinner guests at the Oldsmobile Auditorium. Those unable to arrive in time for the plant dinner were served a hot meal en route.

Charles Smillie, chapter chairman, presided at the meeting and asked for a minute of prayer in memory of the late Dewey Craddock, who was to have been chairman for the evening. Mr. Smillie thanked L. B. Bellamy, national director, for taking over arrangements for the occasion.

Equipped with Newest Tools

Welcoming the group on behalf of Oldsmobile, T. C. Downey, works manager, explained that the engine plant has the latest machine tools, modern layout and provisions for employee comfort. Originally it was set up for 40 units per hour, then for double this production. Another expansion program is now under way.

After Mr. Downey's talk, the members viewed the film, "Trail of the Rocket."

F. W. Haeger, production engineer, outlined the route the visitors would take through the plant. Objectives at Olds, he pointed out, are high quality, precision, and elimination of non-productive labor. Modern transfer machines expedite operations. His company would like all equipment built to JIC standards, Mr. Haeger observed, to eliminate downtime on electric and hydraulic machines.

Before the group started on the tour, Chairman Smillie presented Mr. Downey with a scroll for Sherrod E. Skinner, general manager of Oldsmobile, in appreciation of the firm's hospitality.

* * *

A panel discussion on "Maintenance of Carbide Tools" was held October 5 at the Engineering Society of Detroit. Discussion leaders were: Roy Lapierre, carbide tool supervisor, Ex-Cell-O Corp.; T. J. Brazill, supervisor of tool research, Lincoln-Mercury Div., Ford Motor Co.; and G. D. Vollmer, cutting tool engineer, Detroit Diesel Engine Div., General Motors Corp.

Keck Made Chief Engineer

Aurora, Ill.—Ralph H. Keck has been appointed chief engineer of Aurora Metal Co., G. B. Peters, vice-president, has announced.

Before his promotion Mr. Keck was assistant chief engineer at Aurora Metal. He is a member of the Fox River Valley ASTE chapter.

New York Readies Welcome Mat for Society

Year 'Round Tourist Town at Work on March Meeting

SPEAKERS ARE WRITING technical papers, plants are working up tour itineraries, while host chapter committeemen (women, too) count chairs and hotel rooms and otherwise prepare for large-scale entertaining.

As the news spreads that ASTE will be in town, March 14-17, municipal agencies and civic institutions are offering their facilities and attractions. Some are making special arrangements to give our members a pleasant and profitable time during the Society's 19th annual meeting and second visit to New York. The latchstring is definitely out.

* * *

To stab at random among digests of the more than 30 papers scheduled, here's one on "Raising the Limits on Carbide Milling." William P. Coomey, general superintendent of Rice-Barton Corp., Worcester, Mass., states flatly that no existing miller or horizontal borer will give the ultra in tool life that engineers are reaching for.

But he will show what to do in high speed carbide machining to get maximum tool life. Applications to planers, lathes and vertical boring mills also will be included in his talk. A student of carbides for the past 20 years, Mr. Coomey is a well-known speaker among Eastern ASTE chapters.

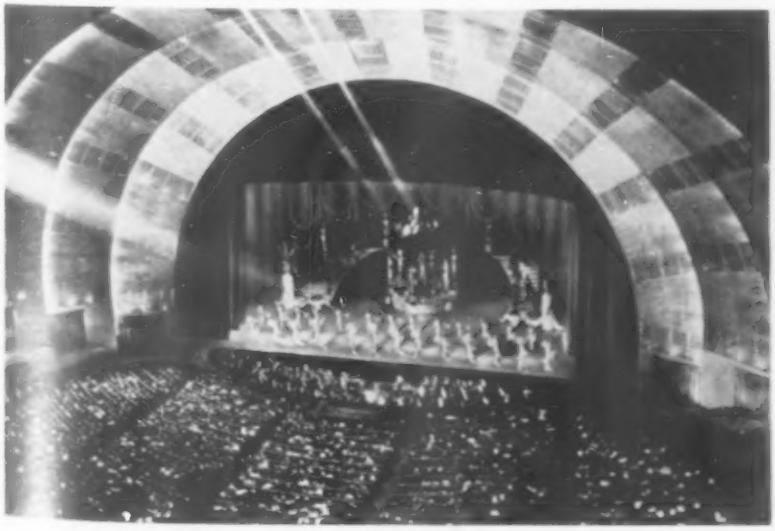
If you've always considered a metallizing gun a maintenance tool, you'll be interested to hear what H. S. Ingham, vice-president and chief engineer, Metallizing Co., Inc., Long Island City, N. Y., has to say about "Tooling Up for Metallizing."

Metallizing, he explains, can often be done on a production basis. When such jobs are tooled up with automatic machines, the human element is reduced, along with costs, and production control is established.

"Automatic metallizing," Mr. Ingham adds, "is sufficiently new and different to warrant the special attention of tool engineers and designers. Many of the factors that must be considered are not immediately apparent."

While discussing these factors, he will cite actual examples of installations.

No mere theorist, Hubert M. Goldman, chemical engineer for Enthone, Inc., New Haven, Conn., has carefully checked the practicability of "Metal Finishing by Abrasive Tumbling." He will describe the techniques in actually cutting down a



Right, top: Shimmering with 7500 tiny lights, the 10-ton Rockefeller Center Christmas tree is a mecca for New York sightseers. A blanket of illuminated stars, in the Christmas eve formation of the constellations, canopies the promenade leading to the tree. Below: Now two-thirds complete, the Cathedral of St. John the Divine is the world's largest Gothic ecclesiastical edifice. Bottom, left: The precision-dancing Rockettes of Radio City Music Hall entertain more than 7,000,000 theatre goers annually. Right: Plushy penthouses, apartments and hotels on 59th Street overlook the big breathing space in Central Park. Photos courtesy of New York Convention and Visitors Bureau, and Rockefeller Center.

Two assembly line workers guide Ford body as it is lowered to chassis at Edgewater, N. J., plant, where ASTE members will see automobile assembly during annual meeting in New York.

metal surface by tumbling, detailing production and experimental operations.

In addition to data on the use of artificial and natural abrasives and other materials, he will present a study of tumbling equipment.

"Manufacturing Fine-Pitch Gears" is the subject assigned to Charles Aldino, processing engineer, Sperry Gyroscope Corp., Great Neck, Long Island.

Starting with gear tooling, Mr. Aldino will deal with gear cutting and finishing machines, cutter maintenance and inspection, inspection of fine-pitch gears, inspection tooling, and finally, master gears. Slides will illustrate all these phases of his talk.

Associated with gear processing for eight of the 11 years he has been with Sperry, the speaker is alternate company representative in the American Gear Manufacturers Association.

How to Measure Stress Analysis

Asked about his topic, "Brittle Coatings for Stress Analysis," Greer Ellis, consulting engineer for Magnaflux Corp., New York City, says, "There's plenty of drama in this experimental stress analysis work, because many jobs are of the detective trouble-shooting type where results are often spectacular."

In the method referred to a brittle coating is applied to the part being tested. When the part is loaded as in service, the coating fractures at right angles to the stress. A calibration bar is used in determining the stress.

By reviewing actual case histories, Mr. Ellis will show how time, trouble and money can be saved with this and related methods.

After developing Stresscoat as a master's thesis at Massachusetts Institute of Technology in 1938, Mr. Ellis went with Magnaflux to manage the Stresscoat Division. Since 1946 he has acted as consultant.

A dynamic equipment policy would give the country the highest standard of living of which our technology is capable, in the opinion of E. M. Hicks, assistant manager, Grinding Machine Div., Norton Co., Worcester, Mass. Mr. Hicks is scheduled to speak on "Economics of Machine Replacement."

Failure to recognize the importance of modernizing and replacement retards national progress, he feels. Equally vital are the national defense aspects of the country as a whole, if American business fails to utilize new productive methods and facilities.

Formula Has Been Developed

He will offer the MAPI replacement formula, a new working tool to substantiate replacement recommendations. Based on sound theory, the formula has been simplified to the point where it is usable to those engaged in administering equipment policies.

* * *

To see how modern equipment justifies itself, you can visit one of the largest mechanized magnesium foundries in the world. Eclipse-Pioneer Division of Bendix-Aviation Corp. will escort a party of ASTE members through their plant at Teterboro, N. J.

The tour will include the tool design and tool manufacturing sections, the instrument and accessory machine shops, and the air-conditioned instrument assembly area, in addition to the magnesium and aluminum foundries. As you go through this plant you'll be amazed at the number of instruments and accessories needed for commercial and military aircraft.

The variety of precision products and their production in relatively small quantities for competitive markets point up the importance of tool engineering to the company.

More than 1500 precision tools are used in the machine shops. A tool engineering staff of 200 is directed by John Webster, master mechanic, and Robert W. McIlwain, tool design supervisor, both of the Northern New Jersey chapter.

At the other extreme, tool engineering for mass production enables Ford Motor Co. to turn out more than 350 passenger cars and trucks daily at its Edgewater, N. J. assembly plant.

A maze of short, independent assembly operations are brought together on the long "chassis" line, as the 10,000 separate parts merge into a single unit.

Nearly a third of the vehicles assembled at this plant are special order jobs for export. Materials handling is carried a step further than in the ordinary assembly plant. At the end of a 60-foot craneway running through the factory, knocked-down and assembled units are lowered into waiting ships' holds at the plant docks.

Eight Other Plants to Visit

Tool engineering as applied to other industries will be on parade at Mack Truck Co., the Propeller and Wright Aeronautical divisions of Curtiss-Wright Corp., American Machine & Foundry Co., DeJur Amsco Corp., Aluminum Co. of America, DuMont Laboratories and Mergenthaler Linotype Co.

More technical information will be disseminated in a two-and-one-half day schedule of sessions and tours than in any comparable period at previous Society meetings.

But it won't be all work and no play. Friday evening is earmarked for the annual dinner. And for members spending the weekend in New York there will be suggestions for seeing the town. If you can stretch your stay over part of the pre-Easter week, just turn the next page and see what's cooking!

Visitors to New York convention will have opportunity to inspect aircraft instrument assembly during tour of Eclipse-Pioneer Div., Bendix Aviation Corp. at Teterboro, N. J.

Cost Keep Atomic Power Decades Away, Says Swain

Springfield, Vt.—Prohibitive costs put commercial production of atomic power 10 to 20 years in the future, an observer of the Bikini test estimated while addressing a dinner meeting of 100 Twin States tool engineers at Windsor House, Windsor, October 11.

Discussing the Bikini blast, Dr. Philip W. Swain, editor of *Power* and *Operating Engineer*, told the ASTE group that the amount of atomic explosive in the bomb has never been revealed. But it is public information that only a minor fraction of the charge, a two-pound piece about the size of a golf ball, actually explodes, releasing as much energy as 20,000 tons of TNT.

The tremendous expense of producing these weapons, he believes, would limit their use to highly strategic targets.

Slides and graphs were shown to illustrate damage inflicted at various distances from the center of A-bomb blasts at Hiroshima, Nagasaki and Bikini. A documentary film on the Bikini experiment concluded the program.

Hinckley Ranney, chairman, presided over a business meeting and Floyd MacArthur, first vice-chairman, introduced the speaker.

Tool and Die Mfrs. Elect Jahn President

Cleveland, Ohio—Two ASTE members were elected officers of the National Tool and Die Manufacturers Association at the annual meeting here October 30.

H. F. Jahn

H. C. Murrer

They are Herbert F. Jahn, president of B. Jahn Mfg. Co., New Britain, Conn., and Herbert C. Murrer, Murrer Tool Co., Cincinnati. Formerly first vice-president, Mr. Jahn now heads NTDMA and Mr. Murrer is the new secretary.

Other officers elected are R. H. Cope, comptroller of Bunell Machine & Tool Co., Cleveland, first vice-president; Alfred Reinke, president, Gus Reinke Machinery & Tool Co., Hillside, N. J., second vice-president, and Herbert Harig, vice-president and treasurer, Harig Mfg. Corp., Chicago, treasurer. George S. Eaton, executive secretary, was reappointed to this position.

Senator Robert A. Taft addressed the opening luncheon of the tool and die executives' meeting on the subject, "What About Small Business."

J. H. Stansbury, Long Beach chapter chairman, welcomes visitors from Los Angeles chapter. From left: A. J. Denis, former national director; Anton Peck, past chairman; Wayne Ewing, incumbent chairman; Mr. Stansbury, and A. D. Lewis, incumbent director.

Proposes 'Incentive Tax' To Speed Defense Effort

Indianapolis, Ind.—A "defense incentive tax" was suggested by a Chicago industrialist as alternative to the controversial excess profits tax, during an address before Indianapolis chapter and 73 guest executives present at an executives night dinner, held November 2 at the Athenaeum.

A. G. Bryant, president of Bryant Machinery & Engineering Co., was the speaker. His subject was "Industry's Survival in Another War."

Such a tax, Mr. Bryant contended, would spur the initiative and ingenuity of American industrial management, reduce costs and speed up production. It would thus curb inflation and lessen the tax burden, while achieving the goal of national security.

Fears Strangling Controls

Referring to the demoralizing effect of the excess profits tax during World War II, Mr. Bryant declared that both management and workers should have incentive for increased production and rewards for high accomplishment.

Controls now being instituted, he feels, may add to a confusion and delay defense production. "The real danger is that within a short time controls may be applied to all phases of business, when the job to be done might be accomplished more efficiently by a freely operating economy."

Industry may have to accept some controls, he admitted, but government should first "set an example of sound organization, coordination and direction of our defense effort."

Mayor Albert Feeney also spoke, complimenting the chapter on its development and expressing pride in the city's industrial activity.

H. D. (Pop) Hiatt, permanent chapter historian, reviewed the background of the local ASTE group and the national Society.

R. F. Krause, chairman, presided and introduced the speakers.

Describes Silver Brazing On Production Basis

Long Beach, Calif.—Production applications of silver brazing was the technical subject at the October 11 dinner meeting of Long Beach chapter at Chu Chu's Restaurant in Compton.

The speaker, R. J. Lafferty of Handy & Harman, supplemented his talk with a film demonstrating actual production set-ups. He displayed samples to further illustrate this method of joining.

Among the 60 members and guests present were Arthur D. Lewis, national director, Anton Peck and Arthur J. Lewis, all of Los Angeles chapter.

* * *

From one of their own members, the Long Beach group learned about locks—from raw metal to the installed product.

Thomas B. Linton of Kwikset Locks, Inc., Anahein, reviewed the history of locks and described their manufacture for 62 members and guests attending a recent dinner meeting at the Ivy Room Restaurant, Compton.

After showing a film on lock production, Mr. Linton and his staff answered questions from the audience.

Other films shown concerned atomic energy and the development of gears.

Tooling, Biggest Factor In Production Presswork

Minneapolis, Minn.—Press design and press life are no longer all-important factors in high production, according to Henry Van Dusen, assistant sales manager of V & O Press Co., Hudson, N. Y.

Automatic feeds and material handling devices are today's tools for increasing presswork, Mr. Van Dusen told nearly 50 Twin City members attending a dinner meeting, October 4, at the Covered Wagon Cafe. To illustrate, the speaker showed slides of press tooling for special jobs. In the absence of Loren C. Blanchar, chairman, Peter Tobias, first vice-chairman, presided.

Moved Lately?

Tell us your new address.

ASTE Took You to the Grand Canyon, Hollywood, the Laurentians, and Now . . .

Bermuda

Post-Convention Luxury Cruise to Coral Isles Brings You Spring in 40 Pleasure-Filled Hours

"SOME DAY," you've always promised yourself, "I'll go to Bermuda." Opportunity will never beat harder on your door than it does right now. For when the Society winds up its annual meeting at New York on March 17, a luxury cruise ship will be waiting to take you to these isles of perpetual spring.

Yes, at 3:00 p.m., Saturday, the gangplank goes up, the band plays "Anchors Aweigh," handkerchiefs flutter at envious crowds ashore, and gay paper streamers float off in the breeze. The palatial *Queen of Bermuda* has sounded her whistle and cast off from her slip. It's thrilling to be aboard.

As our 22,000-ton pleasure ship sails down the North River, you're torn between watching the Manhattan skyline and the Jersey shore. But you take a good, long look at the Statue of Liberty, world symbol of freedom. Then through the upper and lower bays and we're out to sea.

Time for afternoon tea, or maybe a cocktail in the verandah cafe before dinner in the sumptuous dining salon. M-m-m what a menu to try to eat your way through. After this feast you need a few turns around the glass enclosed promenade deck. Then you'll be ready to try out the quarter-million dollar dance floor, or drop into the night club.

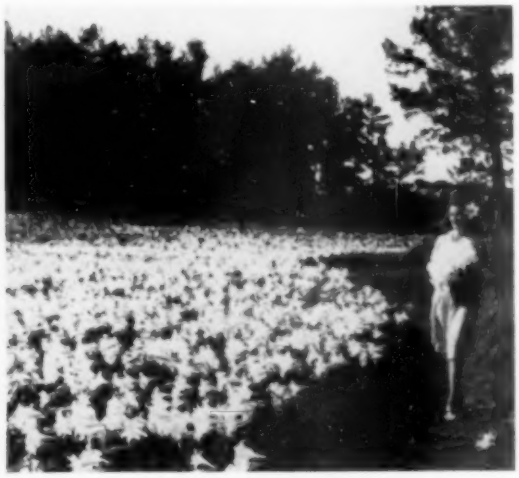
You'll sleep like a baby in your comfortable, air-conditioned room with private bath. In the morning there'll be time for a prebreakfast dip in the Silver Lagoon mosaic swimming pool and a brisk workout in the gym.

Whether you snooze in your deck chair as the liner cuts through the warm waters of the Gulf Stream, play shuffleboard, deck tennis, the ponies, canasta or bingo, time passes all too quickly.

You probably have an engineer's curiosity about the big turbo electric vessel. Let one of the officers conduct you on a behind-the-scenes tour of our floating hotel.

The second evening there'll be new movies to preview, more dancing, entertainment, and sociability with shipmates.

Left: Bermuda bound, these happy shuffleboard players have forgotten winter as they cruise the warm Gulf Stream. Below: Though a mantle of snow may cover the 40-acre hemlock grove in New York City's Botanical Garden, only 40 shipboard hours away fields are whitened with fragrant Bermuda Easter lilies.



Land at Hamilton

At seven Monday morning St. George's Light looms up. It's Bermuda. Soon after nine you're through customs and being welcomed at the smart Princess Hotel—our home de luxe in Hamilton.

And now to see these delightful coral islands by carriage, bicycle, taxi, or ferry. The spectacular Crystal and Leamington caves, the historic old capital town of St. George's, brilliant tropical fish and birds in the government aquarium at the Flatts, colorful underwater sea gardens viewed through glass bottomed boats.

Or you can walk on the sea bottom wearing a diving helmet, fish for sharks in Devil's Hole, or just drive around the picturesque Fairyland section. From the top of Gibb's Hill lighthouse the whole archipelago spreads out around you.

Flowers are everywhere. During our stay hibiscus, oleander, bougainvillea, and the famous Easter lilies will be in bloom. If you get out to Bailey's Bay, be sure to inspect the painstaking process of extracting flower scents at the Lili perfume plant.

You can do your spring shopping too. (It's the week before Easter.) There are bargains in English woolens, leather,

"Oh! could you view the scenery, dear,
That now beneath my window lies,
You'd think that nature lavish'd here
Her purest wave, her softest skies,
To make a heaven for live to sigh in
For bards to live and saints to die in!"

So wrote the Irish poet Tom Moore soon after arriving in Bermuda in 1804 as registrar of the Admiralty court.

china, doeskin gloves; Scotch sweaters, plaids and tweeds; Liberty silks, French perfumes, Irish linens, and native handicrafts—besides imported beverages.

For the price of a paltry gardenia at home, you can bring back exotic passion flower or romantic frangipani corsages for Easter Sunday.

Even minimum accommodations on the luxurious "Queen of Bermuda" are roomy, have private bath.

There'll be starlight dancing in the patio of our hotel, bathing in sapphire water foaming over pink sands on the Princess beach, all kinds of seagoing and landlubber sports. Overlooking Hamilton harbor and a short walk from the shops, the Princess is a hub of Bermuda's festive social activity.

Tuesday you have until three o'clock to finish your sightseeing and shopping. (Of course, you may be so enchanted with this land of cedars and blossoms, waterscapes and green hillsides that you'll want to stay over a sailing. That can be arranged, too.)

Aboard the *Queen* again, we're off on another round of entertainment until 9:00 a.m., Thursday, the 22nd, when we regretfully part at New York.

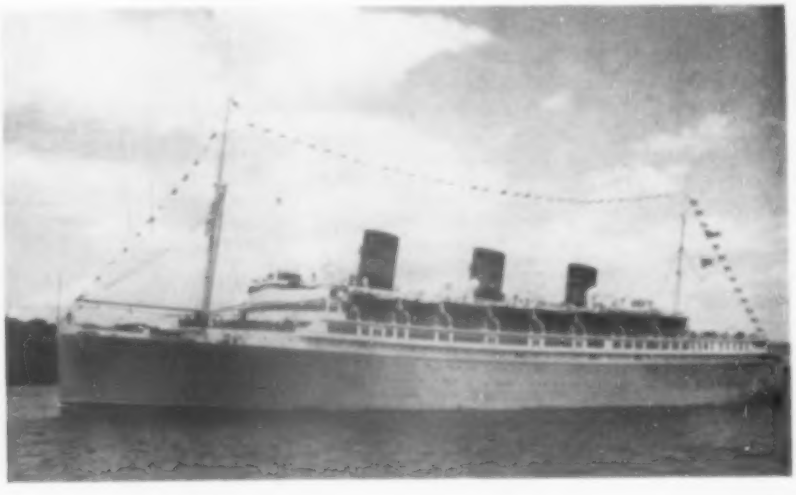
Throughout the trip you'll feel as publicized as a debutante. Photographers will be on board when you leave New York to take sailing pictures for your home town paper. The ship's cameraman will catch you at play on the cruise. In Bermuda the ASTE party will be photographed for the local press.

Our cruise will be in the high season when the *Queen*'s passenger list is crammed with distinguished names. So early reservations are necessary—by January 15 to be sure of accommodations desired. Subject to cancellation, of course, if your plans change. The package rates include room with private bath, and all meals on the *Queen*; a charming room with bath, and meals at the Princess Hotel; Federal and Bermuda taxes. It's all first class.

Invite your family and friends. Everything's arranged for your pleasure. An experienced travel consultant is expected to accompany the party.

All you have to do is check out of the New Yorker Hotel after the convention, make a short cab run to the pier, and you're off on a carefree adventure of a lifetime. For full information, plan of the ship, rates, Bermuda literature, and answers to questions, drop a card today to the *ASTE News* Editor, *The Tool Engineer*, 10700 Puritan Avenue, Detroit 21, Mich.

Left: One of Hamilton's smartest addresses, the Princess Hotel with its cottage colony will be home to the ASTE party during their stay in the mid-ocean paradise. Right: Gala signal flags flying, the outbound "Queen" starts down the Hudson with a merry company of holiday seekers.



Connecticut Members See How Toys Are Engineered

New Haven, Conn.—Eighty-six tool engineers from the New Haven and neighboring chapters recently heard and saw how product design, tool design, and processing are correlated to produce toy electric trains and construction, chemistry and atomic energy sets. The ASTE'-ers were guests of the A. C. Gilbert Co., October 12, for dinner, a technical session and a plant tour.

Raymond E. Smith, director of engineering, was the technical speaker. Using charts, Mr. Smith explained how the engineering organization functions as a team in developing and manufacturing new company products.

Wilbur Sullivan, technical chairman, introduced Mr. Smith and later described departments to be visited in the plant. Guides escorted the tour party.

The engineers found it difficult to tear themselves away from the display room of fascinating toys.

Guests included Ray H. Morris of Hartford, a former Society president; Don Huntting, Hartford chapter chairman, and Thomas Hogan, chairman of the Fairfield County chapter.

Tigges, Staff Members Guests at Windsor

Windsor, Ont.—Four national officials of ASTE and a former director were guests at a recent Windsor chapter dinner meeting at the Prince Edward Hotel.

President H. L. Tigges of Toledo spoke briefly on Society affairs. Secretary W. B. McClellan and Director L. B. Bellamy, both of Detroit, and assistant Secretary-Treasurer W. A. Thomas of Windsor, were introduced to the chapter.

Guest speaker was G. S. Wilcox, assistant factory manager of Plymouth Div., Chrysler Corp., Detroit, and a past director of ASTE. Mr. Wilcox described the role of the tool engineer in automotive production.

The audience of 150 members and their friends viewed a color film, "Windsor—Gateway to Canada."

Basic Research Needed By Nation's Industry

Kansas City, Mo.—Fundamental research is assuming an important role in industry. Seemingly minor problems arising daily can be developed into profitable assets for industry when properly analyzed and developed through research.

Speaking October 4 before 70 members of Kansas City chapter and the University of Kansas student section at a joint meeting on the university campus, Perry L. Bidstrup, executive assistant to the president of Midwest Research Institute, outlined the operation of a research organization.

Research Is Big Business

In the past few years, Mr. Bidstrup cited, this branch of science has grown rapidly. Industry spends two billion dollars annually, while government studies run into another billion. Although the United States is noted for applied research, it is lacking in the fundamental phase. Only 18 persons in this country, he added, have won the Nobel prize for research.

Using colored slides, Mr. Bidstrup described a few of the projects handled by his organization and some of the equipment employed.

After the lecture the engineers and students toured the Fowler Shops and were served refreshments.

During the evening Harold Buddenbohm, student chairman, announced a tour of Butler Mfg. Co.

* * *

At the first fall meeting of the student group, Charles Inderwiesen was elected vice-chairman to succeed Ralph Adkins, called to military service.

Chairman Buddenbohm appointed the following committee chairmen: Eugene Hixson, publicity and membership; John Gerdel, refreshments and field trips, and Charles Inderwiesen, program.

Mr. Buddenbohm also outlined the program of activities that the student section hopes to accomplish during the semester.

Metal Stitching Shown To Be Fast, Safe, Easy

Chicago, Ill.—Advantages of metal stitching in a time of labor shortage and production urgency were impressed upon approximately 100 Chicago members by representatives of Acme Steel Co., who described and demonstrated this operation during a chapter meeting at the Western Society of Engineers, October 10.

This method of joining metal, the speakers pointed out, is easily learned, safe for the operator, and can be performed at high speed.

John E. Ott, executive vice-president of Acme, introduced the subject and reviewed its background before presenting Arthur Denny of his staff.

Mr. Denny continued with the development of metal stitching machines from the original book stitching and subsequent box stitching equipment. The automotive and aircraft industries were credited with popularizing the process. As yet two thicknesses of 18-gage mild steel is the maximum recommended for practical use.

Demonstrates on Machine

Actual applications were described by Parker Krim, who exhibited sample parts. After a question period the engineers gathered around Mr. Krim to watch him demonstrate on a wire stitching machine.

J. J. Demuth of St. Louis, first vice-president of ASTE, was a guest and spoke on the aims and services of the organization.

Thomas C. Barber, chairman, presided and expressed appreciation for the numerous greetings received during his recent illness.

Select Uniform Steel For Exactness in Gears

Montreal, Que.—Steel of uniform grain size is the most important factor in producing gears to close limits, C. R. Staub, chief engineer of Michigan Tool Co., told an audience of Montreal members, meeting October 12 at Canadian Legion Hall.

Mr. Staub's paper concerned gear making from forging to shaving and lapping. Gear shaving is not a cure-all, the speaker cautioned. Only by using accurate tools and machines, and utmost care in each operation will a quality product be obtained, he said. Past experience can serve as a guide by reference to heat numbers on forgings.

Slides were shown to explain hob making, grinding, sharpening and setting. Inaccuracies resulting from improper resharpening were well depicted.

Stanley Wallace introduced the speaker and G. S. Clarke thanked him.

Refreshments were served through the courtesy of Colonial Tool Co., Canadian branch of Michigan Tool Co. and sponsor of the program.

Left: J. J. Demuth, ASTE first vice-president, talks to Chicago members about Society's 1952 exposition in that city. Center: J. E. Ott of Acme Steel Co. tells advantages of metal stitching demonstrated by Parker Krim (right).

Officers of Golden Gate chapters, ASTE and ASM, are speakers' table guests at joint meeting of two societies. From left: Harry Lewis, ASM chairman; B. G. Berlien, ASTE first vice-chairman; Dr. Stewart G. Fletcher of Latrobe Electric Steel Co. (guest speaker), and Al Minetti, ASTE chairman.

Experience Best Guide In Selecting Tool Steel

San Francisco, Calif.—Golden Gate chapter met with the local ASM group for a dinner and a technical session, October 11, at El Curtola Cafe, Oakland. Approximately 150 members of the two organizations were present.

During a brief business meeting I. S. Minetti, ASTE chairman, welcomed and introduced officers and members of ASM. Harry Lewis, chairman of the latter group, responded, inviting the tool engineers to a tour of the General Metals plant on November 13.

Guest speaker was Dr. Stewart G. Fletcher, chief metallurgist of Latrobe Electric Steel Co., Latrobe, Pa. Dr. Fletcher began his lecture on "Modern Tool Steels, Their Characteristics and Handling" by classifying tool steels according to types.

Selection of these steels, he said, should be based on surface hardness, toughness of core, resistance to heat and abrasive wear. Good judgment and intimate knowledge of conditions the metal must withstand were stressed as requisites for choosing the most economical steel for a job.

While presenting a series of slides, the speaker explained various transformation curves and their effect upon different steels. Segregation and its ultimate effect upon the product also were discussed.

A subsequent question and answer period indicated intense audience interest.

A. E. *(Andygrams)* Rylander of *The Tool Engineer* was a surprise visitor and spoke briefly. Mr. Rylander dropped in at the meeting while vacationing on the West Coast.

Bemb Buys Tool Firm

Buffalo, N. Y.—Julius J. Bemb, former partner in the Kirbem Tool Co., 1715 Elmwood Ave., has acquired sole ownership of the company.

Mr. Bemb is a past chairman of the Buffalo-Niagara Frontier ASTE chapter.

'Russian Agent' Unmasks At Fond du Lac Party

Fond du Lac, Wis.—A mystery speaker roused the ire of patriotic Fond du Lac members attending the chapter's annual ladies night dinner dance, November 3, at the Athearn Hotel, Oshkosh.

"Dr. Nicholas Orloff," present by special permission of the Russian embassy, explained the merits of Communism and answered questions during a heated open discussion.

As Dr. Orloff continued with his address, he revealed himself as G. I. Wallace, district governor of the S. E. Wisconsin Lions International. His Russian accent had deceived everyone.

Door prizes were awarded to Mrs. William Felton, Sheboygan; Mrs. George Clapp, Oshkosh; Mrs. Harold Johnson and Mrs. Arthur Richter, Fond du Lac.

K. F. Gallimore and Charles Billberg were introduced as parents of the chapter. For the first time in chapter history, all former chairmen were present. A. F. Schroeder, one of the past chairmen, was toastmaster for the evening.

* * *

On October 13 A. J. Scheid of Columbia Tool Steel Co., Chicago Heights, Ill., lectured on "Tool Steels—Key to Efficient Production."

Position Available

MACHINERY DESIGN ENGINEER

for permanent employment with a leading Connecticut manufacturer of machine tools. Must have extensive experience in the design and engineering of lathes, grinders, and/or, milling machines.

Send complete resume of qualifications and experience. Interviews for qualified applicants will be arranged promptly. All replies will be kept confidential. Address reply to Box 223, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

Gas Meter Production Shown in Color Film

Erie, Pa.—November 7 dinner meeting of Erie chapter was devoted to a lecture on the "Theory and Manufacture of the Displacement Gas Meter."

Some 50 members and guests heard Hilding V. Beck, assistant manager, Metric Metal Works, Erie, present this subject, effectively illustrated with color slides and film. Robert Gray and A. E. Weingard assisted in the program.

Appeals for Council Workers

Mathew Hetzel, delegate to the Erie Engineering Council, reported on that organization's progress. Stanley S. Sadoski, chairman, asked for volunteers to assist in the council's work.

Alva C. Hohing of Walter J. Greenleaf Co. was introduced as a new member.

Guests included: Harry Schoyer, Edward Dahm, George Glenn and Robert Gray of American Meter Co., a Mr. Palmer of Metric Metal Works, Andrew Sperlund, Lord Mfg. Co.; Ernest Kerner, Kerner Tool and Die Co.; and Edward Dau, Jessop Steel Co., Washington, Pa.

Gives Impressions of Japanese

Thirty-seven couples attended the seventh annual ladies night dinner dance, held October 3 at General Electric Community Center.

Following a smorgasbord dinner Mildred Van Dusen of the Erie school system gave a slide-illustrated lecture, "Meet the Japanese." Miss Van Dusen gathered material for her talk during two years' civilian service in the Far East with the information and educational section of the U. S. Army.

Chairman Sadoski presented a gift to Miss Van Dusen in appreciation of her program. All the women guests received carnation corsages.

Visit Cleveland Plant

For their first fall meeting a party of 49 tool engineers left at 6:00 a.m., September 16, by chartered bus for Cleveland. At the Ohio city they were guests of the Cleveland Twist Drill Co. for a tour of the plant and luncheon at the University Club.

C. R. Apthorp, Jr., assistant to general superintendent for Cleveland Twist Drill, welcomed the visitors and Chairman Sadoski expressed appreciation for the company's hospitality.

Arrangements for the tour were made by Walter Cebelinski, chapter public relations chairman, and Lee Pugsley, sales engineer for the host firm.

In the afternoon the engineers watched the Cleveland Indians play the Washington Senators.

After dinner at Euclid, Ohio, the excursionists returned to Erie.

Des Moines Celebrates First Anniversary

Des Moines, Iowa—Two national directors were guests of Des Moines chapter for its first anniversary and ladies night dinner, held October 18 at Hotel Kirkwood.

Joseph P. Crosby of Boston explained the significance of the Society, its aims and achievements. Ben J. Hazewinkel of Denver complimented the young chapter on its progress and extended good wishes for the future.

A. H. Brayton of Des Moines Convention Bureau tells anecdote during address at local ASTE ladies night. At right are J. P. Crosby and B. J. Hazewinkel, national directors of the Society.

Arthur H. Brayton, secretary-manager of the Des Moines Convention Bureau, spoke humorously on "Telling the World Effectively."

Accompanied by Mrs. John Wanamaker, Mrs. Duard Sexton rendered violin selections.

Chairman John Speck welcomed the gathering of 97 members and guests. Each lady received a rose corsage.

SKF Engineer Lectures On Bearings for Tools

Williamsport, Pa.—W. W. Goehring, machine tool engineer for SKF Industries, Philadelphia, addressed Williamsport tool engineers when the chapter met October 9 at the Anglers Club, Newberry.

While discussing "Anti-Friction Bearings and Their Use in Machine Tools," Mr. Goehring showed slides of ball and roller bearing applications. At the conclusion of his talk he answered questions from the floor.

After the technical session William Paul showed a sports film and a reel depicting life in Wyoming.

Richard Huskin, first vice-chairman, introduced Mr. Goehring and William Belknap, chairman, presided. Approximately 45 members and guests were present. Visitors included Peter Horn of the Detroit chapter.

Cites Four Factors Vital To Good Plastics Tooling

Galt, Ont.—"Tooling for Thermoplastics" brought out approximately 100 members and guests of Grand River Valley chapter after a summer recess. The opening meeting of the season was held October 5 at the Grand River Golf and Country Club in Bridgeport.

Speaking from long experience in the field of molding dies, N. C. Taylor, service engineer with the Tennessee Eastman Corp., advised the tool engineers to consider product material, product design, tool design, and technique of tool design before starting work on any mold. He dealt at length on tool design both for compression and injection molding.

Elaborating on the latter method and its application, he named advantages of pinpoint gating.

Shows Plastics Making in Color

A color film on the processing of Tenite, a cellulose acetate plastic, was shown to acquaint the members with the manufacture, processing and myriad uses of this material.

Charles Seay, sales representative of the Rochester office of Tennessee Eastman, introduced Mr. Taylor. Charles Spicer thanked the speaker for his informative address.

In the absence of Harry Whitehall, chapter chairman, Harry Sehl, first vice-chairman, presided. He promised a series of educational, as well as social, meetings through the current season.

A social hour and refreshments followed the technical session.

* * *

Tools and dies were forgotten as 175 ASTE'ers and their guests entered into baseball, horseshoe pitching, dart throwing and other contests during the first chapter field day, held early this fall at Waterloo County Game and Fish Protective Association grounds.

A buffet lunch counter operated by Treasurer Percy Barber's "chefs" supplied picnic fare throughout the day.

The outing closed with a drawing for prizes. Frank Lewis, entertainment chairman, was in charge of the event. His committee was assisted by Harry Whitehall, chairman; David McCready, membership chairman, and Mr. Barber.

Brainard Promotes Cross

Warren, Ohio—Sherman S. Cross has been appointed operations manager of Brainard Steel Co., succeeding J. Howard Patton, recently resigned, Thomas J. Moore, Jr., vice-president and general manager, has announced.

A member of the Akron ASTE chapter, Mr. Cross studied engineering at the University of Akron and at Goodyear Industrial University, Akron. He joined Brainard in 1949 as chief product engineer.

Vocational School, Host For Educational Program

Evansville, Ind.—Forty-two Evansville members were guests of Mechanic Arts High School for an educational program, October 9.

Herbert Erdman, administrative assistant to the superintendent of schools, was the speaker. His subject was the "Role of Mechanic Arts High School in Evansville's Educational Program."

Mr. Erdman told of the conception of the school in 1937, how it was co-ordinated with industrial leaders' thinking to give students shop and related training.

To qualify for Mechanic Arts juniors or seniors from Evansville's six other high schools must have average or better grades and be planning to enter industry. After completing two years vocational training, they return to their home schools to graduate. Most local industries give such graduates a year's credit on apprenticeship training.

Arthur Fritz, chapter education chairman, was program chairman.

Dinner in the school cafeteria preceded Mr. Erdman's talk. Speakers' table guests introduced were: Ralph Becker, superintendent, Staley Berryman, director of vocational and adult education, and Ted Ashby, trade and industrial coordinator, all of the Evansville public school system.

Hosts to Evansville chapter for an educational program at Mechanic Arts High School are, from left, Staley Berryman, Ralph Becker, and Herbert Erdman (speaker), all Evansville school system executives.

Modernization, Tooling Pay Off for Gun Maker

Kansas City, Mo.—Good tooling and mass production equipment have enabled a 134-year-old company to meet present high costs and make satisfactory profits.

Slide films of cost-cutting equipment installed by Remington Arms Co., as part of a $12 million modernization program, were shown to 45 members and guests attending Kansas City chapter's executives night. The annual dinner function was held November 1 at Roselli's Restaurant.

Merrill Berkley of Remington Arms projected the pictures to illustrate his talk, "Arms and Ammunition for the Hunter." During his lecture Mr. Berkley traced the company's history.

Compares Unified Threads With Former Standards

Rochester, N. Y.—Chauncey G. Newton, district sales manager of Pratt & Whitney and a past chairman of Rochester chapter, was the technical speaker at an ASTE meeting held October 2 at Rochester Institute of Technology.

Mr. Newton discussed "Unified Threads" a timely subject in view of the expanding armament program. With slides the speaker showed major differences in screw thread standards prevailing before adoption of the unified thread system in 1948 by the United States, England and Canada.

The new standard was discussed in a technical article appearing in the July 1949 issue of *The Tool Engineer*.

In the absence of First Vice-Chairman James O. Horne, due to illness, Third Vice-Chairman Donald Kohler introduced Mr. Newton.

Chairman Emmett Moore welcomed the approximately 75 members and guests.

Golfers Shiver at Fall Tournament

Overcast skies and threats of rain failed to dampen the spirits of some 80 men who attended the second annual golf tournament at Churchville Park, October 14.

After a cold autumn day on the course, the golfers enjoyed the comfort of crackling logs in the clubhouse fireplace. A buffet lunch was served and the engineers relaxed into informal groups playing bridge, canasta and other card games.

Golf prizes were awarded as follows: best golfer, John Krivitza; worst golfer, Harry Leibert; blind bogey, George H. Britton, Stanley Michelsen, William L. Waldeck, John Young, Ernest F. Schramm, Cecil M. Sheldon, Frank Sears and Emmett W. Moore.

Gerald K. Sick and Mr. Schramm were co-chairmen for the outing, assisted by Arthur Lang.

DeBoer Cites Advances In Optical Inspection

Utica, N. Y.—Through improved optical systems, better illumination, increased sharpness of image and freedom from distortion, many plants have found inspection by optical projection the best method for achieving quality control, according to Willis E. DeBoer, vice-president of Engineers Specialties Div., Buffalo, N. Y.

Mr. DeBoer spoke on this subject at a meeting of 45 Mohawk Valley tool engineers held October 24 at the Moose Home.

In some instances where contours are involved, optical projection is the only practical method, he added.

Fred Barker, chapter chairman, presided and introduced the speaker.

Left: Harry Leibert is dubbed worst golfer and John Krivitza, best, as G. K. Sick, entertainment chairman, and Don Kohler (right) third vice-chairman, check scores at Rochester chapter's golf tournament. Right: C. G. Newton of Pratt & Whitney discusses the international thread standard at a technical session.

Challenges Industrialists to Use T. E. Know-How To Check Disastrous Rise of Inflationary Spiral

Worcester, Mass.—Tool engineers have what it takes to help break the present inflationary trend—production knowledge. By ingenious methods they can create new products from old, new methods of making goods—better and cheaper. They will find ways to bring the cost of this country's manufactures to a standstill.

So James Y. Scott, president of the Van Norman Co. and an ASTE'er, told some 250 Worcester members and top management executives attending the chapter's executives night, November 7, at Hotel Sheraton.

Singling out the management men in his audience, Mr. Scott went on to remind them that "during the war management showed a production genius that enabled us to far outstrip anything we had previously done. But even though we produced armament in unheard of quantities . . . it was without regard to costs."

The pent-up postwar market, he continued, did not haggle over price, either. The important thing was to produce in quantity and fast. This, with the constant demand for increased wages, has brought higher and higher prices.

Price Pressure Demands Action

"When is top management again going to become tremendously cost conscious? I think very soon." Even before the Korean war, Mr. Scott revealed, the machine tool industry began getting a flood of inquiries for cost reduction machinery.

Old-line New England industries are being jeopardized, he warned, by aggressive young companies with modern, low cost methods.

"Let's start engineering again. Let's do what we did, and analyze every operation." A dual-headed economy, military and civil, will require even more adept handling than our one-track, wartime operation. The well-being of every American is tied up with the skill of our engineers, the Springfield tool manufacturer emphasized.

Other speakers at the meeting were Joseph P. Crosby, national director from Boston; Harry E. Conrad, executive secretary from Detroit headquarters, and Thomas C. Sweeney, vice-mayor, representing Mayor Andrew B. Holmstrom. Carroll L. Morse, chairman, presided.

Industrial Leaders Present

Speakers' table guests included: Milton P. Higgins, president, Norton Co.; Richard A. Heald, president, Heald Machine Co.; John F. Tinsley, president, Crompton and Knowles Loom Works; Philip M. Morgan, president, Morgan Construction Co.; Carter C. Higgins, president, Worcester Pressed Steel Co.; Frederick W. McIntyre, Jr., president, Reed-Prentice Co.

George W. Motherwell, works manager, Wyman-Gordon Co., and Richard H. Cunningham, editorial writer representing George F. Booth, editor and publisher of the *Worcester Telegram* and *The Evening Gazette*, all of Worcester.

From the surrounding area were: Simond McKay, vice-president, Union Twist Drill Co., and Arthur Starrett, president, L. S. Starrett Co., Athol; O. S. Buckner, president, Bay State Abrasive Products Co., Westboro; George T. Simonds, Jr., president, Simonds Saw and Steel Co., Fitchburg; Hamilton W. Thayer, works manager, Draper Corp., Hopedale, and Erik O. Pierson, works manager, Whitin Machine Works, Whitinsville.

The Union Twist Drill Glee Club of Athol entertained during the evening.

St. Louis Hears Osborn

St. Louis, Mo.—Dr. Harry B. Osborn, Jr., technical director, Tocco Div., Ohio Crankshaft Co., Cleveland, Ohio, appeared before St. Louis chapter, October 5, as guest speaker.

Dr. Osborn talked to about 125 tool engineers on the theory, equipment, applications, tooling and limitations of Induction Heating.

A. Carl Weber, director of research and advertising for Laclede Steel Co., was the coffee speaker.

B & S Representatives Detail Grinding, Gaging

Philadelphia, Pa.—A double-header technical program was presented to Philadelphia chapter October 19 by two representatives of Brown & Sharpe Manufacturing Co., Providence, R. I.

James Meehan, head of grinding machine sales, described correct grinding procedure, stressed the meaning of precision in measuring and the necessity of observing the fundamentals of good housekeeping.

A recent development, the Electralign, sets the swivel table accurately with the sliding table, Mr. Meehan stated.

Compares Merits of Gages

After tracing the history of gaging, W. T. Nystrom of Brown & Sharpe's gage sales department, discussed mechanical, optical, pneumatic, and electrical gaging. Each type of gage was compared for qualities of magnification, stability, resistance to vibration, linearity, and constant pressure. The speaker showed films and slides illustrating actual parts being checked.

The dinner meeting of 140 members was opened with an invocation by Foster Crayton. Music during the meal was provided by the Ferko String Band. Frank Matelyan also entertained with a banjo selection.

Charles U. Shellenberger, Community Chest chairman, reminded the members of the beginning of the United Fund drive.

New plans for raising scholarship funds are being formulated, Howard Gross, vice-chairman of scholarship activity, announced.

Williams Stevens, education chairman, reported on his committee's projects.

In commenting on the work of the National Standards Committee, Harry Smithgall, chapter standards chairman, told the membership of a long range program under way with the Joint Industry Conference.

William P. Ryan and Richard H. Heffelfinger, student winners of this year's chapter scholarship awards, were present at the meeting.

Publishing House Opens Plant to Dayton Group

Dayton, Ohio—Despite a driving rain 66 members of Dayton chapter turned out October 9 for a tour of the McCall Corp. plant.

The size, speed and number of machines required to print and bind publications and to make garment patterns surprised many of the visitors.

Dinner in the company dining room and a business meeting preceded the plant inspection. C. R. Miller, chairman, and R. J. Armstrong, vice-chairman, were the presiding officers.

Dr. S. G. Fletcher of Latrobe Electric Steel Co. addresses joint meeting of Los Angeles chapters of ASTE and ASM.

ASTE, ASM Co-Sponsor Tool Steel Program

Los Angeles, Calif.—Metallurgical and application aspects of "Modern Tool Steels" were considered at a joint meeting of the Los Angeles chapters of ASTE and ASM.

About 400 members of the two societies assembled October 12 at Roger Young Auditorium to hear Dr. Stewart G. Fletcher, chief metallurgist of Latrobe Electric Steel Co., discuss this subject. Dr. Fletcher outlined characteristics and uses of the various classifications of tool steels and how they should be handled, both by the metallurgist and the tool engineer. A brisk question and answer period followed.

* * *

The local tool engineers held their annual golf outing October 22 at Willowick Country Club in Santa Ana. Sixty-eight members and guests competed for some 50 prizes. In addition each player received a top-grade golf ball.

Low gross score for the day was turned in by a guest, Fred Mulh—76. Albert Tetzloff captured the low gross for members, with an 80. Next in order were: W. S. Grau—81, Edward Riddell—82, Hans Mesner—83, Carl Weitzel—84, and Ralph Chrissie—85. Low net winner was Wayne Ewing with 64.

Mr. Riddell and Mr. Chrissie handled arrangements for the event.

Talks About Gear Making

Muncie, Ind.—Ben F. Bregi, executive engineer, National Broach and Machine Co., addressed some 75 members and guests of Muncie chapter on the subject, "Modern Methods of Gear Manufacture." Mr. Bregi was the speaker at a dinner meeting, October 3, at the Delaware Hotel.

He dealt with evaluation of the gear in modern applications, resulting from engineering developments to improve gears. Research, he added, is making gears still more efficient.

Sees Europe Gaining In Tool Production

Rockford, Ill.—November 1 was Bones Nite at Rockford chapter. Held at the Lafayette Hotel, the dinner was attended by 62 executives and engineers. George Rigeman, chapter chairman, was toastmaster.

Myron S. Curtis, director of engineering, Warner & Swasey Co., Cleveland, Ohio, spoke on "Production for Freedom." During a recent tour of Europe, Mr. Curtis had opportunity to compare production methods. Some parts of the Continent, the speaker found, are turning out quantities of intricate machine tools on their own initiative.

Our engineering departments, he warned, must continue to develop new techniques and designs so that America may maintain its leadership in production—a country's true wealth.

* * *

On October 4 the chapter heard M. Eugene Merchant, senior research physicist of Cincinnati Milling Machine Co. His subject, "Metal Cutting and Cutting Fluids—Basic Facts," was illustrated with slides and a film, "Physics of Metal Cutting."

Attorney David Connally, president of the Rockford United Nations Association, was the coffee speaker. The group he heads was organized two years ago to make local citizens conscious of UN activities and of their own part in aiding this effort.

Special Machine Plant Visited by Canadians

Toronto, Ont.—Some 200 Toronto members and their friends participated in the chapter's first fall event, a tour of the Modern Tool Works plant. This visit gave the engineers an insight into special machine building from drawing board to test.

J. Clayton Knapp, superintendent of quality control for Ford Motor Co. of Canada, Ltd., presented an informative slide-lecture on "Quality Control as Related to Mass Production."

The speaker showed how each part could "spot control" the variability of the manufactured product. Department foremen, he emphasized, should keep a close check on all operations, using the fullest possible range of tolerances while maintaining production without selective assembly.

Wear cycles on milling and drilling machines, as well as on grinding wheels, can be definitely charted for spot control of quality, Mr. Knapp observed.

John Lengbridge, education chairman, announced chapter-sponsored evening classes in Die Design to be held at Ryerson Institute of Technology. Members serve as instructors for courses.

Coming MEETINGS

CENTRAL PENNA.—January 8, Speaker: T. E. Eagan, chief metallurgist, The Cooper-Bessemer Corp. Subject: "Nodular Iron."

CHICAGO—December 12, 8:00 p.m., Western Society of Engineers. Speaker: E. E. Fluskey, chief engineer, Chicago Screw Co., Bellwood, Ill. Subject: "Cost Reduction and the Automatic Screw Machine." January 9, 6:00 p.m. Speaker: Herman Goldberg, president, Snow Mfg. Co., Bellwood, Ill. Subject: "A Dream of the Future."

Student section meeting: December 18, 8:00 p.m., Allied Institute of Technology. Speaker: Bernard Better, research director, Scully-Jones & Co., Chicago. Subject: "Control of Quality During Manufacturing—How It Affects Production and Costs." March 17-21, 1952. Tool Engineers Industrial Exposition.

DETROIT—December 14, Book-Cadillac Hotel, Christmas Party. January 4, 7:30 p.m., Junior Room, Engineering Society of Detroit. Subject: "Designing for Carbide." January 11, dinner, 6:15 p.m. Father and Son Night.

Student section meeting: January 18, 7:30 p.m., Junior Room, Engineering Society of Detroit. Subject: "Processing."

ERIE—January 9, 6:30 p.m., Gannon College Commons Room. Speaker: W. L. Kennicott, chief engineer, Kennametal, Inc., Latrobe, Penna. Subject: "Design Factors of Carbide Single-Point Tools."

NEW YORK, GREATER—March 14-17, Hotel New Yorker. Nineteenth Annual Meeting, ASTE.

NORTHERN NEW JERSEY—December 12, 8:00 p.m. Robert Treat Hotel, Newark, N. J. Speaker: Dr. Richard C. Hitchcock, research engineer, inventor and lecturer, Westinghouse Electric Corp. Subject: "March of Research." January 9. Speaker: E. L. Murray, Warner & Swasey Co. Subject: "Fundamentals of Turret Lathe Practice."

PHILADELPHIA—December 20, Engineers Club. Christmas Party. January 18, Drilling and Tapping Symposium.

POTOMAC—January 11, Dodge Hotel. Speaker: H. L. Strauss, Jr., technical director, National Diamond Laboratory, New York. Subject: "Industrial Diamond Tools."

SAGINAW VALLEY—January 18. Speaker: Guy R. Cowing. Subject: "Education and The Tool Engineer."

TWIN STATES—December 13, Trade Winds Cafe, Springfield, Vt. Speaker: J. L. Schwab, Methods Engineering Council. Subject: "Next Ten Years of Tool Engineering." January 10. Speaker: B. F. Bregi, National Broach and Machine Co. Subject: "Gearing Problems."

WORCESTER—January 9, Worcester Institute of Technology. Joint meeting with ASM. Speaker: Bruce Warner, vice-president and general manager, New England Plating Co.

Materials Now Tested On Code, Gaging Basis

Houston, Texas—An entirely new conception of materials testing was presented to Houston chapter, when William T. Bean, Jr., consulting engineer, addressed an ASTE dinner meeting at Ben Milam Hotel, October 10.

The methods Mr. Bean described are based on test code and stress and strain gaging rather than straight physical tests of samples.

Thomas H. Shartle, president of Texas Electric Steel Castings Co., introduced Mr. Bean.

Morris Frank, *Houston Chronicle* sports writer and humorist, spoke extemporaneously during the coffee period.

T. J. Gilchrist (left), Houston chairman, visits with W. T. Bean, Jr., consulting engineer, and T. H. Shartle (right) of Texas Electric Steel Castings Co., both guest speakers at recent chapter dinner meeting.

Norton Names Van Keuren Chief Sales Engineer

Worcester, Mass.—Robert G. Van Keuren of Worcester chapter has been appointed chief sales engineer for the Abrasive Div., Norton Co. The announcement was made by Ralph M. Johnson, vice-president in charge of sales.

Mr. Van Keuren succeeds A. Oakleigh Bush, another Worcester member, who died September 2.

Since 1945 Mr. Van Keuren has been a section head in the sales engineering department. He joined Norton in 1923 as a member of the adjustment section in the Worcester sales department. Six years later he transferred to sales.

Developer of Helicopter Rescue Equipment Dies

Bridgeport, Conn.—After an association of more than a quarter of a century with Igor I. Sikorsky in the development of airplanes, flying boats and helicopters, Boris P. Labensky, 55, passed away October 25 at his home in the Putney section of Stratford.

An experimental engineer for the Sikorsky Aircraft Div., United Aircraft Corp., Mr. Labensky was credited with the major role in perfecting helicopter rescue equipment from the litter-capsules of World War II to the present eight-patient "flying sickroom."

Used to Move Korean War Wounded

Originally military helicopters had only suspended stretchers covered with canvas bags or "pup tents." Today's smaller models are equipped with "bubbles," "blisters" and "capsules" to carry more patients in greater comfort. During the Korean War helicopters have evacuated scores of wounded from the front. Many of these, according to station hospital surgeons, would have died but for the use of rotor-craft.

Born in Uman, Kiev, Russia, March 30, 1895, Mr. Labensky graduated from the Kiev Middle School in 1914 and, two years later, from the Russian Imperial Naval Academy, with the rank of lieutenant.

Took Technical Courses

The following year he spent as chief officer of an Arctic patrol ship. In 1918 he completed academy post graduate courses for naval officers with designation as senior specialist in mechanics and electromechanics. He also studied these subjects at the Institute Emperor Alexander III in Petrograd.

His next assignment was as professor at the Naval School of Junior Officers, Nevel. In 1920 he came to the United States and worked as a tool engineer for the Lestershire Spool & Manufacturing Co., Johnson City, N. Y. He also managed a farm operated by former Russian naval officers.

Devoted Decade to Helicopters

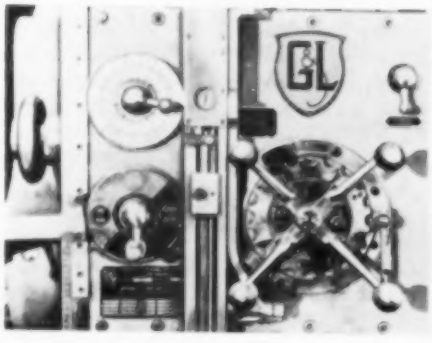
It was in 1922 that he became one of Mr. Sikorsky's first associates in aviation at Roosevelt Field, L. I. For the past 10 years he had been working on rotor-craft equipment. During his residence in Connecticut he was naturalized as an American citizen.

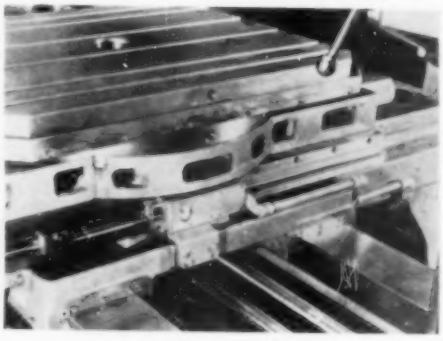
A member of the Fairfield County ASTE chapter, Mr. Labensky also held memberships in the Institute of Aeronautical Sciences, the Society of American Military Engineers, and the U.S. Power Squadron. He was also active in Sea Scout programs.

More ASTE News on Page 74

TOOLS OF TODAY

Electrically Operated Positioning by Giddings & Lewis





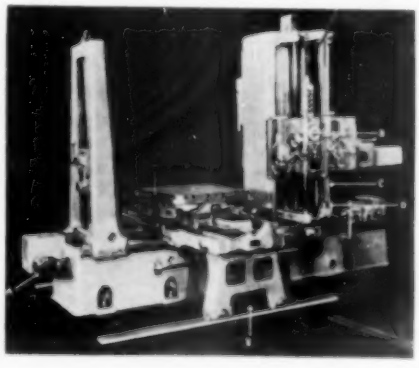
An electrically operated positioning device, announced by the Giddings & Lewis Machine Tool Company, Fond du Lac, Wis., is designed for positive automatic machine settings within 0.0002 to 0.0005 in. With this unit, horizontal boring machine table and headstock fine-feed movements are mechanically controlled to predetermined settings without need of time-consuming final hand adjustments.

As indicated in the detail illustrations, above, this automatic positioning device consists of two complete control units, one for the vertical setting of the headstock on the machine column, the other for the lateral setting of the table on the saddle. Depending on the requirements of the job, these units may be operated individually or simultaneously, as desired. When components of the positioning device are activated, they disengage the table and headstock rapid traverse directional conrtols and then automatically position the table or headstock to final setting.

To use the automatic positioner, a starting point—which can be anywhere on the face of the workpiece being machined—is established as the initial step. Depending on whether the job is a single part to be precision bored, or production work, one either makes measurements from this point with conventional end measuring rods or, to simplify repetitive settings, with a job rod bored with various hole spacings on each of its four sides to receive a stop pin.

To set the machine table, rods are placed in a U-shaped trough located on the front side of the table. These measuring units rest between a permanently mounted dial indicator and an adjustable stop which, according to standard practice when using conventional end-measuring rods, is set at the extreme left of the table. To control headstock settings, precision measuring units of similar type are clamped to a vertical shaft attached to the machine column. In the latter instance, an adjustable stop must be set at the lowest position of the headstock, as per normal manual procedure.

After the desired travel has been determined, and the rods are in place, machine directional controls are manually engaged. The machine table and headstock then move in rapid traverse until directional clutches are automatically disengaged by a selector switch. At this point of the positioning cycle there is a slight over-travel—say 0.005 to 0.010; however, both headstock and table are automatically fine-fed in return, within 0.002 to 0.0005 in. of the desired precision machine setting, by means of a magnetic clutch attached to the reduction unit and the machine feed screw.



A clearer idea of the operation may be had by referring to the photograph of the machine, center illustration. Here, A indicates the constant speed motor gear reduction and magnetic clutch used to drive the machine feed screw; B, the selector switch and dial indicator for headstock setting; C, the vertical shaft for holding measuring rods or job rods; D, the adjustable stop; and E, the auxiliary saddle supports and runways required on all machines equipped with the automatic positioning device.

It may be added that the dial indicator is used only for establishing initial setting; after that, it merely serves as a reference for subsequent locations. All measurements are made automatically without actual need of the indicator, and the complete positioning cycle is said to require but a few seconds as contrasted to the considerably slower manual positioning.

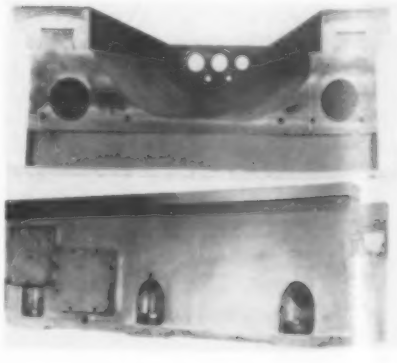
Hardened Ways on G & L Machines

In addition to the automatic positioning, Giddings & Lewis now offer their horizontal boring, drilling and milling machines with hardened and ground ways. As designed, a unique structural feature and a novel method of hardening combine to insure continuous machining accuracy.

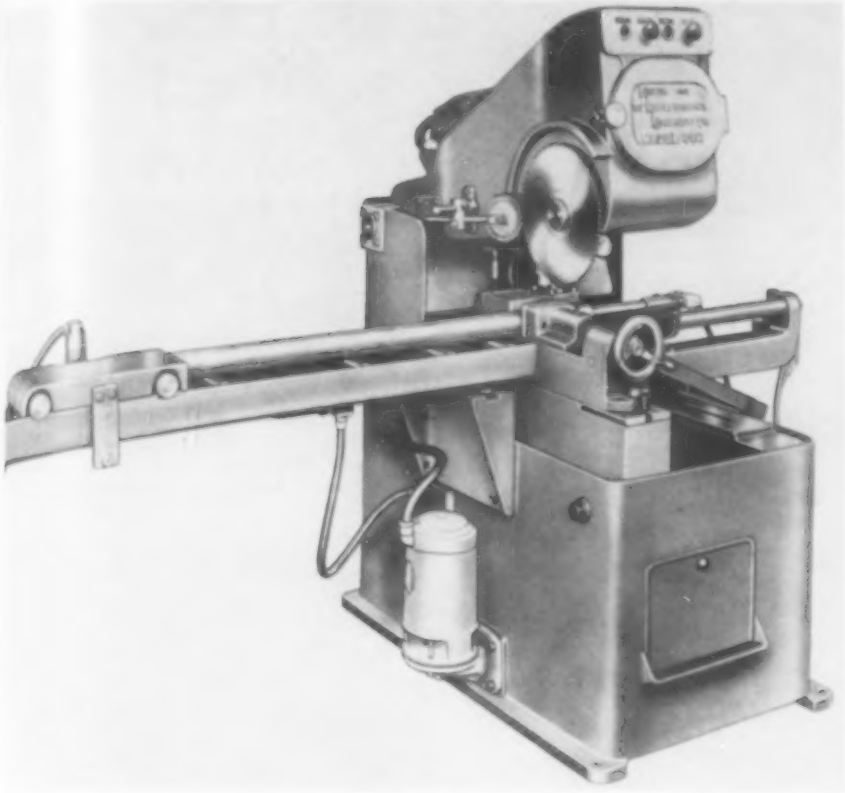
The hardening method, which results in a consistent hardness throughout the ways, produces a uniformity said to effectively prevent scoring under any but abnormal conditions. Naturally, this would extend life and initial accuracy. During an additional and final surface hardening, the ways are held in a special fixture which duplicates the actual mounting surfaces used on the machine component. After hardening, the ways are precision ground.

The high degree of parallelism after the ways are installed is attributed to an improved method of mounting. As indicated by the detail illustration at lower right, a tongue on the mounting surface of the bed, saddle or runway "slip-fits" into a channel on the undersurface of the way. For accurate and solid support, however, the way actually rests on broad hand-scraped shoulders located on either side of the tongue which forms an integral part of the basic machine casting.

The mounting method has been developed especially to minimize transmittal, to the ways, of torque strains and stresses set up by temperature changes; in addition, the mounting is said to compensate for vibration created by other adjacent machinery. The G & L line, which includes floor, table and planer type machines in a broad range of sizes, is now available with hardened ways on the bed, saddle, column and runways. T-21-1



Circular Saw for Square or Angular Cut-off



The Model No. 00-G Circular Sawing Machine, by Motch & Merryweather Machinery Co., 715 Penton Bldg., Cleveland 13, Ohio, is designed for fast and accurate cutting off on materials up to 3 in. round or square. Anglar cutting up to 45 deg—a novel application in circular sawing machines—is also made possible by inserting clamping jaws of the desired angle and moving the supporting stock conveyor. Or, the Model OO-G can be mounted on a swivel base, where it can be swivelled to the desired cut-off angle.

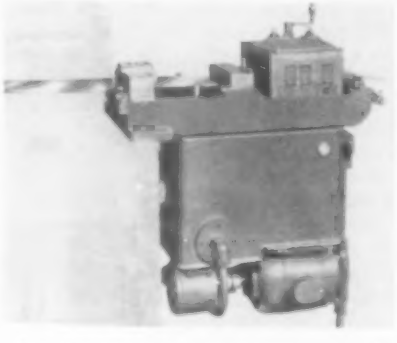
Stock can be fed into the machine either manually or by an automatically operated air-powered stock feeder for standard lengths up to 24 in. width, additional lengths available for special applications. Special gaging and holding fixtures for odd shaped extrusions and intricate parts can be readily adapted to the machine.

The gravity feed of the sturdy one-piece saw head is controlled by means of a conveniently located hydraulic flow control valve. The saw blade is driven by the direct drive geared saw head, and changes of sawing speeds are made by means of pick-off gears. **T-12-3**

USE READER SERVICE CARD ON PAGE 65 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Hydraulic Stock Feed

A Haller gripper-type Stock Feed, for use on most punch presses, is announced by Special Engineering Service, Inc., 8161 Livernois Ave., Detroit 4, Mich. Known as Model 8FTS, this hydraulically-operated unit has capacity to handle stock up to 8 in. wide and to feed any desired length up to 24 in. Accuracy of feed is guaranteed by the maker within 0.003 in. to 0.005 in. on each stroke.



Installation and adjustments can be made quickly and easily so that the stock feed can be moved readily to other presses when desired. It is actuated from the press ram and is said to have sufficient power to pull the stock through a roll-type straightener which is an integral part of the unit. The unit, which is completely self-contained, is mounted on the bolster plate and can be located to feed from the left, right, front or back.

T-12-2

di-acro PUNCH

NEW DOUBLE PURPOSE PRESS

Available in two sizes, 6" and 12" throat depth

Now you can punch holes of various shapes as large as 4" diameter in 16 gauge steel—also blank, draw, emboss, form—all with the new DI-ACRO Punch. It is ideal for both experimental and production work.

The precision ground triangular ram of this double purpose press prevents punch head from turning, assuring perfect alignment at all times for accuracy in duplicated parts.

A Turret Stripper of exclusive DI-ACRO design automatically strips material from punches of all shapes. Roller Bearing cam action develops 4-ton pressure with minimum effort. Adjustable gauges assure exact location of holes.

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DI-ACRO is pronounced "DIE-ACK-RO"

DI-ACRO DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

375 EIGHTH AVENUE • LAKE CITY, MINN.

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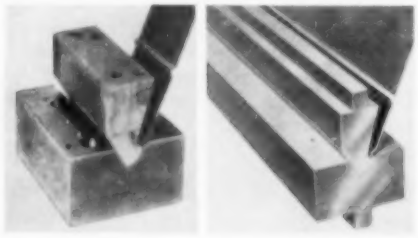
Brake Try-out Dies

At once in the nature of a service and a development in tooling, a method of predetermining shapes, by Service Machine Co., Inc., Elizabeth, N. J., promises marked economies for users of press brake dies.



As developed by Service, the company first produces "tryout" dies in short sections before making up the complete die. These short sections are formed to any desired shape, angle or contour and are tried out on any small convenient press. Once the exact shape has been determined, the full-length dies are made to the exact shape.

This method has proven highly practical in cases of bending such materials as nickel silver, hard or half-hard brass, stainless steel and various other metals which, because of their nature, tend to resist pre-calculated results even when all factors of stress and chemical structure are known. As a result of first trying out in inexpensive short sections, it is stated that there has been complete elimination of "reject" dies and, in addition to wide customer satisfaction, a reduced load on both supplier and customer engineering staffs.

T-12-4

Metal Dust Collector

A metal Dust Collector, by the Delta Power Tool Division, Rockwell Manufacturing Co., Milwaukee 1, Wis., is a self-contained, portable unit for use wherever disposal of metal dust is essential to health of workers and protection of machinery. According to the manufacturer, the dust collector is universal in application, with openings so located that it can be attached to all types of abrasive units. This makes it partly applicable for grinding, sanding, polishing, buffing, and other operations.

A powerful squirrel-cage type fan that moves 350 cubic feet of air per minute, sucks both fine and coarse dust and small particles through an air filter. Larger particles fall into an easily-removed pan at the bottom of the dust collector. The standard filter, furnished with all models of the Delta-Milwaukee Dust Collector, is fireproof, has high filtering qualities, and may be readily removed for cleaning. It need not be thrown away since, when properly cleaned and oiled, it is said to last indefinitely.

Also announced by Delta is a line of low-cost-Surface Plates which, as claimed, have advantages usually obtained only in hand scraped, precision plate. The plates are heavily ribbed, provided with clamping ledges for attaching to vises, angle plates or other accessories, and finished with edges machined square with one another and with the surface. Because the surface is true to start with, the plate may be scraped to a master for ultimate precision.

T-12-5

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ARMSTRONG

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give lowest possible tool cost

The more operations you tool with ARMSTRONG TOOL HOLDERS, the greater your savings and profits. These permanent multi-purpose tools are low in initial cost. They give years of continuous service, reducing the direct tool cost per job to a matter of cents. Using small cutters or bits quickly ground from stock shapes they "Save: All Forging, 70% Grinding and 90% High Speed Steel."

But greater still than these substantial direct savings are the indirect savings these tools effect. They reduce "tooling-up" to a matter of minutes—and costly delays and keep men and machines producing. Strong and efficient, they permit higher speeds and heavy feeds—machine more pieces per machine hour, machine more accurately, reducing losses through rejects or spoilage.

Use ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters and shapers, on turret lathes and screw machines, to cut costs and increase profits.

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-62

Equalizing Gang Vises

Two improved Gang Vises for precision grinding of small parts have been introduced by Dery Tool & Die Company, Pine Meadow, Conn. Available in 3- and 6-position models, these vises are designed to handle the most intricate grinding jobs and according to the manufacturer, to speed up operations.

Both models incorporate equalizing blades which automatically compensate for differences in work tolerances and eliminate "toeing in" of undersize parts. The 3-position model—shown—is primarily designed for use with a magnetic chuck but may be had with modifications for clamping to conventional chucks. The vise holds work in a central position, thus making it possible to "flop" the fixture for grinding opposite sides without additional adjustments. For end grinding, the vise is positioned as illustrated. Standard capacity for this model is ¾ x 1½ in. V-block vise face is provided to meet users' specifications.

The 6-position gang vise, designed for use on magnetic or non-magnetic chucks, has a standard capacity for parts ranging from ⅛ to 1 in. and features a vise face which holds parts against a smooth, lapped surface for greater accuracy in the grinding of precision parts. Central positioning of the work makes fixture "flopping" possible without adjustment. Width of the fixture may be specified to accommodate parts requiring grinding of both ends.

Manufactured to users specifications, these gang vises are fully described in new, descriptive literature. **T-12-6**

Super Speed Air Motors

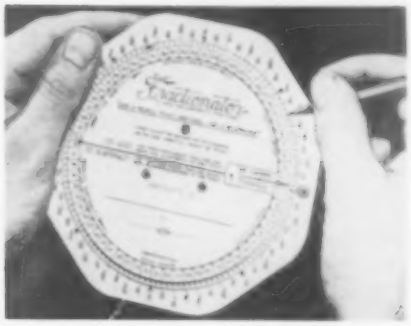
Announced by The Bellows Company, Akron, Ohio, is the Bellows Super-Speed Air Motor, a double-acting air cylinder designed for extremely high piston speed and power from normal operating air pressure. As an example, the Model BSSM-5$_{7}$–2½ in. bore size—is said to develop enough force at 100 lbs air pressure to punch a ½ in. diameter hole through 1/16 in. thick mild steel.

The motors are currently available in bore sizes 2½ and 3⅝ in., either equipped with Electroaire or manual valves, and with all of the standard mountings. Fully described in company literature, available on request.

T-12-7

Fraction Calculator

A circular-type calculator for quickly adding or subtracting fractions, in units of 1/64ths, is announced by Charles E. Wells, P. O. Box 25, Montrose, Calif., inventor. Known as The Fractionator, the device consists of three discs. The scale on the outer disc shows fractions in 32nds and the inner disc in 64ths. The center disc is dialed with a pencil point.



To add the fractions—as, for example, 3/16, 5/32, 9/64 and ¼—dial the center disc clockwise, using the designated fractions shown in the upper portion on the inner and outer discs. The answer then appears in the answer slot together with its decimal equivalent. To subtract, dial the disc counter-clockwise. Said to be precision built and 100 percent accurate, it sells for $1.00. **T-12-8**

HERE'S HOW TO DO FAST ACCURATE TAPPING RIGHT ON YOUR DRILL PRESSES

Ettco-Emrick

TAPPING ATTACHMENTS

For regular production tapping or extra tapping capacity, just mount one of these inexpensive tapping attachments on your drill press. They'll fit any make or model and are designed to turn out clean, accurate threads. It's the combination of hair-trigger sensitive friction clutch and automatic reverse that assures top tapping speed and full tap protection.

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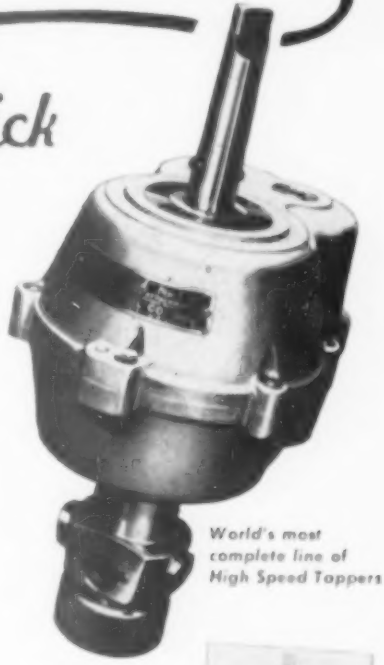

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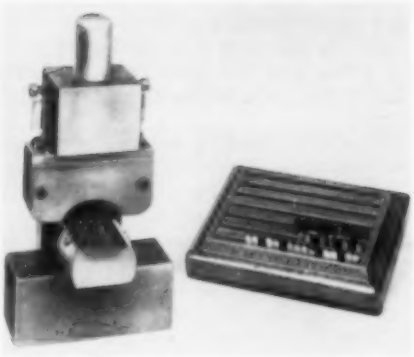
Marker for Rounds



A marking device for stamping round or curved metal parts was recently announced by M. E. Cunningham Co., 169 E. Carson St., Pittsburgh 19, Pa. Named the PF-20 Periphery Stamping Fixture, this marking tool features a unique type arrangement which permits the use of regular straight body type for curved marking.

An improved retaining feature allows the characters to stamp on a specified curved radius and eliminates the need for retaining pins and slotted type. The holder can be made suitable for one or two rows of type, which is easily changed by removing the face plate of the holder. The number of characters that can be used are limited by their size and the radius of the piece to be marked.

Cunningham stamping fixtures usually are made to order for marking a specific part, but can be manufactured adjustable for use on various shapes and sizes. However, when the degree of curvature changes, a different type holder must be used. T-12-9

Improved Metallograph

An improved Metallograph, announced by American Optical Co., Instrument Division, is a routine control instrument designed for superior optical performance together with convenience and simplicity of operation.

In this instrument, which is said to represent a progressive step in the field of metallography, all controls and adjustments are within easy reach. Directly in front of the operator are the 5 x 7 in. camera, the microscope eyepieces, the ball-bearing mechanical stage and, within easy reach, the electrical control panel for the arc and visual lamps. The four objectives on rotating turret, the photographic eyepieces mounted on a quick-change slide, and the camera shutter and the color filters are all operable from a sitting position.

The optical systems for photography and visual observations are coupled to permit visual focusing, thereby eliminating the necessity of ground glass focusing. Grain size measurements, ferrous or non-ferrous, are compared directly on the ground glass with standard grain size charts, and case depth and linear measurements are readily and accurately made with an accessory micrometer rule.

Selection of magnification is rapid, no tables or charts being required. The objective, eyepiece and camera bellows setting are all indentified by the standard A.S.T.M. magnifications, these ranging from 50v to 1500v with 2000v available on special request. Monocular or binocular bodies are available.

The AO Metallograph is equipped with a standard Graflex camera back using inexpensive double plate holders. An Autofocus coarse adjustment stop on the stage eliminates possible damage to optics, and "Apergon" objectives are infinity-corrected, balanced for high contrast and good color correction. The desk has a linoleum top and storage space for accessories and supplies.

T-12-10

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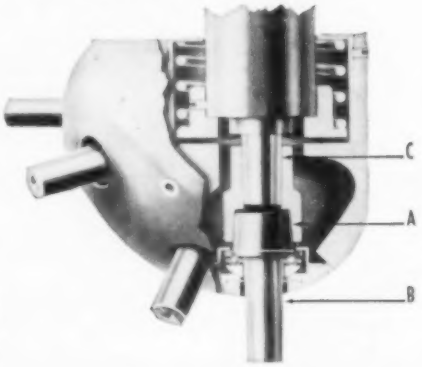

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Eight-page catalog, 4K-W, describes company's line of retaining rings, grouped according to basic use together with data for each with drawing of typical cost-saving applications; includes information about materials, finishes, and technical services provided for manufacturers. **Waldes Kohinoor, Inc.**, 47-16 Austel Pl., Long Island City 1, N. Y. **L-1**

Grinders, Rotary Surface

Bulletin No. 245-2RM covers general description of (Hanchett Type) automatic rotary surface grinders with special emphasis on exclusive features, illustrations and specification tables included. **Mattison Machine Works**, Rockford, Ill. **L-2**

Steel Hardening Compound

Circular discusses facts about carburizing steel hardening and alloying compound, showing how to use it and pointing out main advantages. **Doughty Laboratories, Inc.**, 299 Madison Ave., New York 17. **L-3**

Bushings and Liners

Two-page technical bulletin presents line of more than 1700 standardized drill jig bushings and liners for "micro" size drills ranging from No. 80 to 3/16 in. with drawings, tables of dimensions, and descriptive text pointing out major points. **Micro Drill Guide and Engineering Co.**, 18515 Weaver Ave., Detroit 28. **L-4**

Dresser

Dupliform die grinding process covered in illustrated brochure with emphasis on principal advantages and details of construction; drawings show use of tracer correction feature. **Airborne Accessories Corp. Tool Div.**, 25 Montgomery St., Hillside 5, N. J. **L-5**

Gear Speed Reducers

Some 190,000 combinations of sizes, ratios and types of standard double-enveloping gear speed reducers covered in 8-page bulletin 8901-50 so arranged to put all information relating to each size range on adjacent folds for quick reference; also contains information on ratings, dimensional drawings, specifications. **Cone-Drive Gears, div. Michigan Tool Co.**, 7171 E. McNichols, Detroit. **L-6**

Unloader, Automatic

"Iron Hand," self-contained automatic unloader for removing sheet metal stampings from mechanical and hydraulic presses, described in 8-page brochure with action photos and detail drawings showing operation cycle and special features; also has analyses of savings from typical installations, and instructions for installation and operation. **Sahlin Enginering Co.**, 267 Ferndale St., Birmingham, Mich. **L-7**

Valve, Hydraulic

Catalog Section 202 devotes 52 pages to illustrating and describing wide range of 4-way hydraulic valves each model explained with working drawings, specification cut-away views and operational diagrams of piston designs. Circuit layouts for important types of control also shown. **Rivett Lathe & Grinder, Inc.**, Brighton 35, Boston, Mass. **L-8**

Special Machinery

Company's wide variety of multiple operation production machines illustrated in folder which also introduces engineering and management personnel, and outlines company's facilities and equipment. **Standard Tool & Mfg. Co.**, 2500 Meldrum Ave., Detroit 7. **L-19**

Drill Heads

Recent 28-page catalog illustrates and describes drill heads containing various numbers of spindles for reaming, facing tapping, threading; installation photos and cross-section engineering drawings indicate full details. **U. S. Drill Head Co.**, Dept. P, 616 Burns St., Cincinnati. **L-10**

Differentials

An accurate and convenient means of combining algebraically two mechanical quantities measured by angular displacement is described in 4-page folder, "Arma Mechanical Differentials." **Arma Corp.**, 254 36th St., Brooklyn 32, N. Y. **L-11**

Power Wrench

Bulletin 215 provides descriptive and technical data on power wrench and control equipment for application to single spindle machine tools; outlines sequence of operation, and shows typical installation and wiring diagrams. **The Cushman Chuck Co.**, Hartford 2, Conn. **L-12**

Cylinders, Hydraulic

Catalog 233-A presents 28 pages of illustrations, specifications, design, construction and operation features and suggestions for uses of company's high pressure hydraulic cylinders. **Hanna Engineering Works**, 1765 Elston Ave., Chicago 22. **L-13**

Burnishing and Polishing

Recent development involving completely automatic machine equipment for wet ball burnishing and polishing covered in bulletin TDB-50; important features, including use of exclusive material with outstanding wearing advantages; also contains specifications for standard line. **Lupomatic Industries, Inc.**, 4510 Bullard Ave., New York 66. **L-14**

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"Di-Ro Stand" by P & W

Designed for use with P & W Kellerflex flexible shaft machines, but adaptable to any other flexible shaft machine or portable grinder, the Di-Ro Stand facilitates the handling of heavy dies, molds, patterns and castings during hand finishing operations. The stand, of sturdy welded construction is 2 ft. square, 30 in. high. A turn-table on which heavy work can be rotated freely to allow working from one location, is mounted on a heavy duty thrust bearing. Fully protected from dust and chips, it is capable of handling work loads up to 3 tons.

With the operator working in one position, handling time is reduced along with the chance of injury from pulling or turning heavy work about on wooden benches. Mounting the Kellerflex on a hinged arm, attached to the side of the stand, allows it to swing in an arc of 180 deg. This gives the operator freedom of movement with the handpiece and keeps the flexible shaft clear of the work. Further information may be had from Pratt & Whitney, Division, Niles-Bement-Pond Co., West Hartford 1, Conn. **T-12-11**

Carbide-Tipped Counterbores

In line with improvements in design and a growing demand for carbide-tipped cutting tools, Wendt-Sonis Company, Hannibal, Mo., has developed their Counterbores to eliminate chatter and provide an extra-smooth finish. In addition—and due to a Wendt-Sonis design which provides maximum support behind the carbide tips—the tools are said to produce more pieces between grinds. **T-12-12**

Color-Identified Stones

The Industrial Products Division of the Elgin National Watch Company, Elgin, Ill., has announced a specially engineered line of aluminum oxide and silicon carbide abrasive stones, the latter available from stock.

Stated as an outstanding feature of the line is color identification for instant selection of the proper stone. Each stone is permanently color tipped in a brilliant range from black to yellow, according to its grit size. Hardness and cutting characteristics are precisely controlled.

In addition to Elgin Dymo Diamond Compound, the company's diamond abrasive, this line provides a more complete selection of finishing and polishing supplies for tool, die and mold makers, sizes, shapes and cutting characteristics having been carefully selected to meet fine finishing needs.

Sold under the trade name Elgin Dymo and exhibited at the recent National Metal Exposition, the stones range in size from $\frac{1}{8}$ x 4 in. to 1 x 6 in., from 220 to 600 grit and from extra soft to medium hard. Rectangular, square, triangular, half-round shapes are available. **T-12-13**

Having Trouble with Conventional Ballbearing Centers?

TRY *Glenzer* TIMKEN BEARING

SHOCK-PROOF LIVE CENTERS

They're precision tools, made for use on the smallest tool room lathe or largest railroad shop equipment. You'll find their Timken Bearings provide better, longer service with much less maintenance. Resilient triple shock-absorbing pads reduce tool breakage and work-spoilage to a minimum.

Fully guaranteed against defects in material and workmanship

LOADS AT 100 R.P.M.:
Thrust: 197 to 3460 lbs.
Radial: 1047 to 7274 lbs.

Utility Tools

Send for INDEX CIRCULAR D for complete data on sizes, styles, prices, etc.

THE J. C. GLENZER CO. Inc.
1552 E. NINE MILE ROAD, DETROIT 20, MICH.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-67

Cincinnati Grinders Extend Filmatic Line

Three additional sizes have been added to the Cincinnati line of large plain and traveling table roll grinding machines. Machines added are the 16 in. Heavy Duty and 20 and 24 in. Plain Grinders; and the 16, 20 and 24 in. Roll Grinders. These sizes round out the Cincinnati line to include both standard weight and heavy duty machines in all sizes from 10 to 24 in. swing.

Conforming to other Cincinnati grinders, the grinding wheel spindle bearings are the Filmatic type in which segments, free to rock slightly in the housing bore, admit wedge-shaped oil films between them and the spindle journal diameter as rotation occurs. The films build up to high pressures, supporting the spindle on oil and eliminating metal-to metal contact; in addition these bearings are self-adjusting for variations in forces created by the grinding action.

A DC motor, controlled electronically from an AC source, drives the table through a rack and pinion type of drive which, further provides dial selection of an infinite number of traverse rates from 3 to 120 in. per minute. To eliminate shock, the table automatically accelerates and decelerates at table reversal. No mechanical clutches are employed, and table tarry may be adjusted independently at each end of the stroke.

Coolant flow and headstock spindle rotation automatically start and stop with the table traverse, or independently, as desired. All important bearings are automatically lubricated, and an individual circulating system supplies filtered oil to the grinding wheel spindle bearings. A second circulating system automatically lubricates the table and cross ways with EP oil.

The headstock is a dead spindle, DC motor-driven unit having a speed range of 20 to 72 rpm for the 16 in. size, and 15 to 54 rpm for the 20 and 24 in. sizes. Taper hole in both headstock and footstock spindles is No. 15 B & S.

A wide selection of available extra equipment includes automatic wheel balancing and hydraulic profile wheel truing equipment. The roll grinding style includes power cross feed to the wheelhead, and tilting wheelhead type roll cambering mechanism. Adjustment for amount of camber is obtained through a double eccentric and change gear arrangement.

Plain machines are built in seven lengths at 2-foot intervals, from 48 to 192 in., while the roll grinder style is built in the same lengths up to 168 in. Complete specifications may be obtained from Cincinnati Grinders Incorporated, Marburg Ave., Cincinnati 9, Ohio. T-12-14

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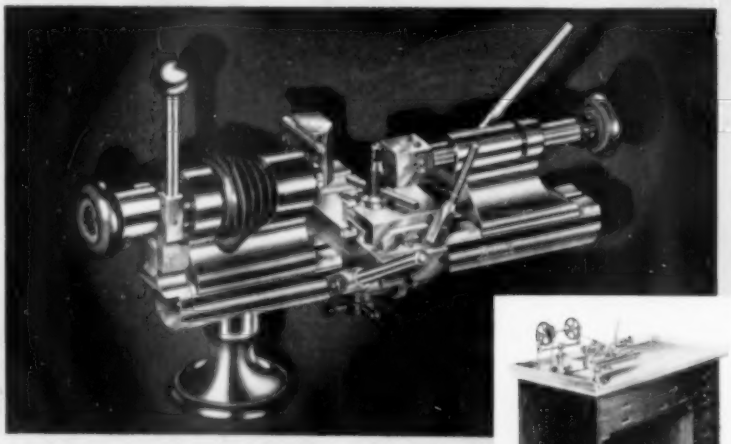
TO REQUEST ADDITIONAL
TOOLS OF TODAY INFORMATION

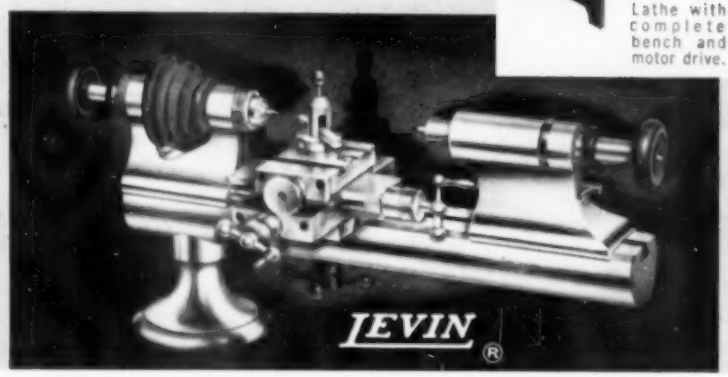
HOLD A ROD .004" IN DIAMETER

WITH COMPLETE ACCURACY



A *LEVIN* lathe makes delicate precision easy because it is designed for working with small parts. Collets from .004" to 5/16" are standard and kept in stock. Two sizes of lathes with maximum collet capacity either 3/16" or 5/16", swing 4", bed length 12". Full line of accessories for second operations, production, tool work and model making. Send for catalog.

Lathe with complete bench and motor drive.



COMPLETE CATALOG illustrates and describes full line of accessories . . . compound slide rests, grinding, milling and screw cutting attachments, cross slide, collet closer and other useful items.

LOUIS LEVIN & SON INC., 782 E. PICO BLVD., LOS ANGELES

FOR FURTHER INFIRMATION, USE READER SERVICE CARD: INDICATE A-12-68

Cyclone Type Duskolectors

Hammond Machinery Builders, Inc., 1661 Douglas Ave., Kalamazoo, Mich., announces Models CYO-6 and 6YB-6 in their line of Cyclone Type Duskolectors. Model CYO-6, here shown, is recommended for installations for exhausting air to the outside.

Model CB-6, which is of the same construction but fitted with a dust proof bag, is adaptable where conditions permit recirculating the air. Their larger dust capacity, and 2 hp motor provide a heavier duty dust collecting system for dust, grit, lint, saw dust, plastics and buffing compounds.

Capacity of both models is 1150 cfm —velocity 5600 fpm with 2 hp motor. Base is 26 in. in diameter and dust pan capacity is 10,620 cu. in. Overall height is 86 in., inlet size is 6 in. and outlet size is 7 in. Fully described in company bulletin, available on request.

T-12-15

Helical Gear Chuck

Announced by the MP Tool & Engr'g. Co., 11487 Nine Mile Rd., Van Dyke, Mich., is an adjustable, self-centered Helical Gear Chuck. The design incorporates basic rack teeth to combine pitch diameter contact along with base helical contact—that is, with the line-of-action.

The basic rack teeth are also a duplicate of the hob cutting teeth, which implies that the hobbing tool and the gear chuck have in common the vital factor of the helical gear—the base helical line. The self-centering and locking motion is effected through a rotary motion of the teeth, thus permitting a wider tolerance to be given to sizes over wires.

T-12-16

Chrome Plated Tool Holders

Super Tool Company, 21650 Hoover Rd., Detroit 13, Mich., has announced a line of chrome plated, ejector-type Tool Holders, of which a typical model is shown in the inset.

The increased holder life resulting from the chrome plating is well illustrated by the production job, pictured below, in which 6 in. diameter shafts of high carbon alloy steel were turned down to 5¼ in. at a surface speed of 400 rpm.

As stated by the maker, previous holders had failed even before one carbide insert was used up; on the other hand, a Super Chrome Plated Holder showed no sign of erosion after turning the equivalent of 22 miles of chips. The chrome plating effectively resists wear.

T-12-17

Grobet ROTARY FILES and TOOLS

THE COMPLETE LINE FOR EVERY INDUSTRIAL PURPOSE over 5000 shapes, sizes and cuts

GROBET Hand Cut, and Ground from Solid ROTARY FILES

⅛" SHANKS

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★ We invite you to send for Catalog HF2 of Grobet Swiss Files; Catalog HR2 of Grobet Rotary Files; Catalog F3 Grobet Rifflers; Catalog HB1 of Grobet Burs; Catalog HC of Grobet Countersinks.

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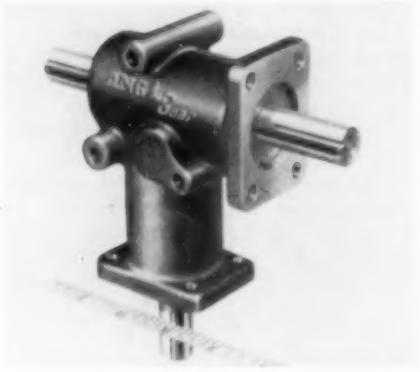
ANGLgear by Airborne



Airborne Accessories Corporation, 25 Montgomery St., Hillside 5, N. J., announces the development of a 1 hp model of the ANGLgear for use in either manual or power operated systems. It is production tested and rated at 750 inch-pounds static torque; shaft diameters are $\frac{5}{8}$ in. and special units with special shaft extension can be furnished on special order.

Combining high load capacity, long service and neat appearance in a compact design, this ANGLgear—designated models R-320 and R-330—is available in either 2-way or 3-way units with a standard 1 to 1 gear ration and a 2 to 1 reduction as an optional feature. T-12-18

MILNE'S COMPLETE LINE OF HOLLOW AND SOLID TOOL STEELS HAVE OVERALL COLOR IDENTIFICATION THAT SIMPLIFIES INVENTORY CONTROL

MILNE'S TOOL STEELS ARE "UNFORGETABLE" BECAUSE THEY'RE KOLORKOTED – The entire length of the steel is spray painted an identifying color for permanent, quick-as-a-glance identification. Each piece of Milne tool steel keeps on telling you and your employees what it is. Milne's steels are practically confusion-proof.

MILNE'S TOOL STEELS ARE "UNFORGETABLE" BECAUSE EACH HAS A MATCHING HEAT TREAT CARD—With every shipment goes a heat treatment card of a color that matches the steel. Gives complete heat treat instructions. Eliminates costly wrong guesses.

With Milne Tool Steels you *can't forget what you get or how to treat it as long as you have it.*

The tool steel selector shown above helps you pick the proper Milne steel and gives you the complete story on it. Ask any Milne office for your copy, today.

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American Leading Tool Steel Specialists
Complete Line Of Tool Steels—Hollow and Solid

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-70

Wide-Field Binocular Scope

The George Scherr Company, 200 Lafayette St., New York 12, N. Y., announces a wide-field Binocular Microscope with an attachment designed to simplify counting of threads in fabrics. With the Oestermann Attachment, it is said that even the finest weave can be counted, thread for thread, without error.

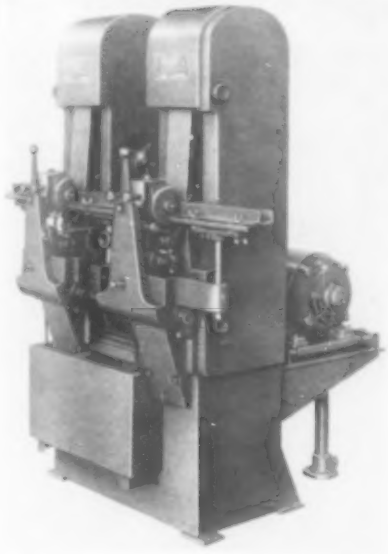
The binocular feature produces a stereoscopic, 3-dimensional image said to bring into sharp relief every individual thread of the cloth. T-12-19

Portable Band Saw Welder

A portable, low-cost Band Saw Blade Welder, by Brennan Mfg. Co., 228 Seeley St., Brooklyn, N. Y., is designed to handle the 0.050 in. diameter contour-cutting band saw blade, as well as all types of blades up to $\frac{1}{2}$ in. flat. The welder, which is fully automatic, includes a built-in grinder for removing flash from the weld. It is further equipped with a gage for checking thickness of weld on flat saws. Descriptive literature available from the manufacturer. T-12-20

Centerless Polisher

Production Machine Co., Greenfield, Mass., has developed a centerless superfinishing and polishing machine—the "Four Eighty Four"—designed for sanding, grinding and finishing of both metallic and nonmetallic materials.

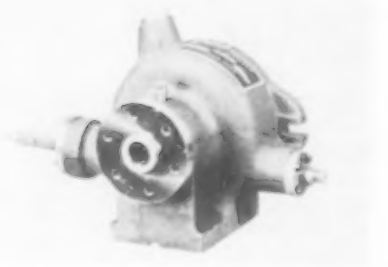


A duplex machine, this tool is designed to handle straight or tapered cylindrical work in capacity up to 1½ in. diameter in two passes, thereby practically doubling output as compared to a single-head machine.

Designed on the centerless principle, no centering or chucking is required—just feed the parts and finishing proceeds automatically. Fully described in a comprehensive bulletin, available on request. **T-12-21**

Positioner-Indexer

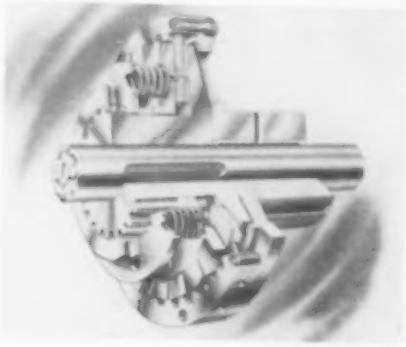
A positive locking, 3-position Indexer, by the Erickson Tool Division, 2309 Hamilton Ave., Cleveland 14, Ohio, is designed to simplify and speed up machining operations requiring three divisions equally spaced—that is, at 120 deg.



Designed for air or hydraulic operations, whichever is desired, the indexer may be connected to table controls for automatic cycle without further attention from the operator. Suitable holding devices may be mounted on the spindle, and the indexer may be used horizontally or vertically, as desired. **T-12-22**

Constant Tension Slip Clutch

A Slip Clutch by the Hilliard Corporation, Elmira, N. Y. is designed to maintain constant tension or constant torque, regardless of driving speed, on winding operations. The clutch promises wide application in industrial winding uses such as the printing, paper making, plastics, wire and textile industries; is also useful as a safety device for overload protection.



Features include ventilated plates, cooling fins, and pressure springs with long deflection range for accurate adjustment. Single double and triple plate construction is available. When the function is constant tension, the regular adjusting nut is replaced with a sliding collar.

The clutches are offered in sizes from 2⅜ to 27 in. diameter with torque range up to 10,000 foot pounds. **T-12-23**

WHERE SET-UP TIME MAKES A BIG DIFFERENCE

BLACKHAWK MAKES THIS JOB SET-UP IN 4½ HOURS

To be profitably accomplished, small-lot production on multiple spindle screw machines requires a minimum of set-up time. Greenlee Automatics were especially designed for rapid machine changes to accommodate small-lot work.

The Blackhawk Mfg. Co., of Milwaukee, manufacturers of hydraulic jacks, bending equipment, tools, and bungs, find Greenlee Automatics well suited for their critical production requirements. They like the Greenlee's easily-changed forming slide cams, rapid stroke-setting arrangement, and interchangeable tooling facilities, finding these and other features ideal for making profitable runs of 10,000 or more pieces. Properly-tooled Greenlee Automatics can solve your production problems, whether your job runs are large or small. Why not submit *part prints for cost-saving recommendations?*

SET-UP FOR "SPEED" COUPLER PART

Twelve operations on this steel piece are performed in a cycle time of 31 seconds. Included are forming and shaving to close tolerances, facing, turning, and undercutting, accurate deep drilling, threading and tapping. Set-up time is 4 1/2 hours. Only one tool change is needed on a 10,000 run.

PRODUCTION MACHINERY
GREENLEE
GREENLEE BROS. & COMPANY
1992 MASON AVENUE
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MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

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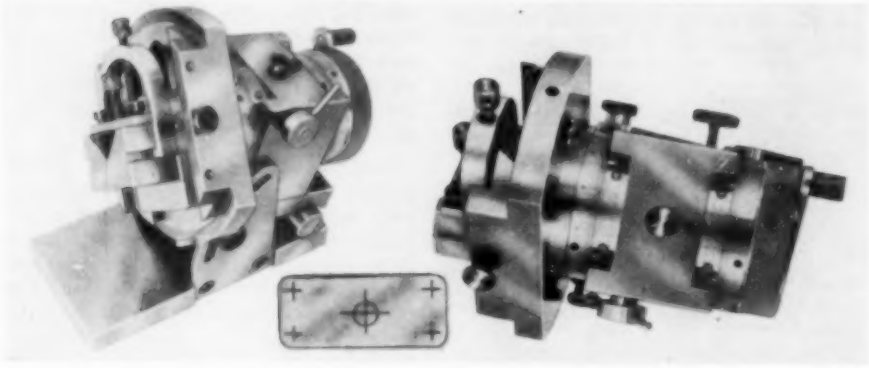
Grinding Attachment Provides Accurate Setting



The Starco Sine-A-Dex, announced by the Star Gage Co., 267 Oak Grove Ave., Springfield, Mass., is designed to lower toolroom time costs. As suggested by the inset, lower center, it is particularly applicable to grinding such items as rectangular punches requiring a radius at each corner; one-setup grinding of eccentrics; and off-center grinding in almost infinite variety.

A precision tool, it incorporates a V-block which permits setting off center in both directions. Two setting rings, with finely cut verniers, provide for rapid and accurate setting of included angles on either side of any reference line. T-12-24

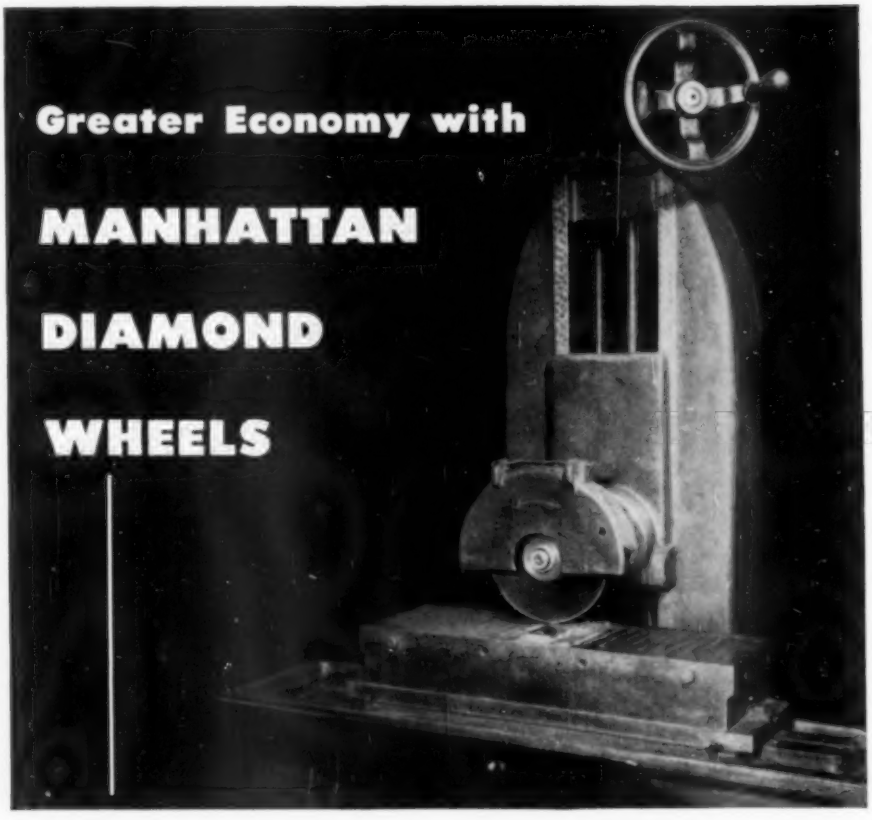


Photo shows set-up for surface grinding tungsten carbide and steel—with a diamond wheel.

The resinoid bonds of all Manhattan Diamond Wheels are especially developed to enable them to resist loading or glazing when grinding tungsten carbide and steel. No dressing of the Manhattan Diamond Wheel is necessary. Greater economy is the result. Send for catalogue 2D.

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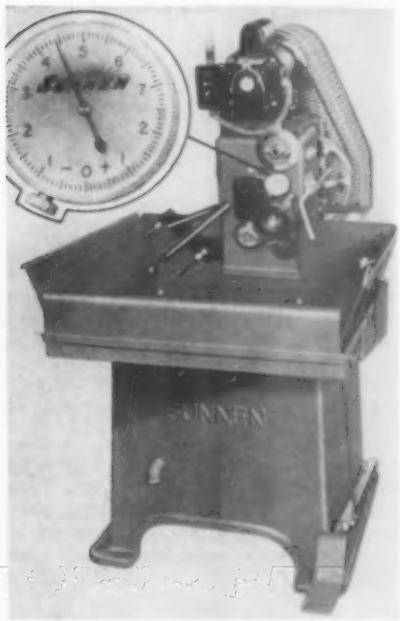
Size Control Gage



Announced by Sunnen Products Co., 7910 Manchester Ave., St. Louis 17 Mo., is a Size Control Gage designed to maintain a continuous check on hole sizes during honing.

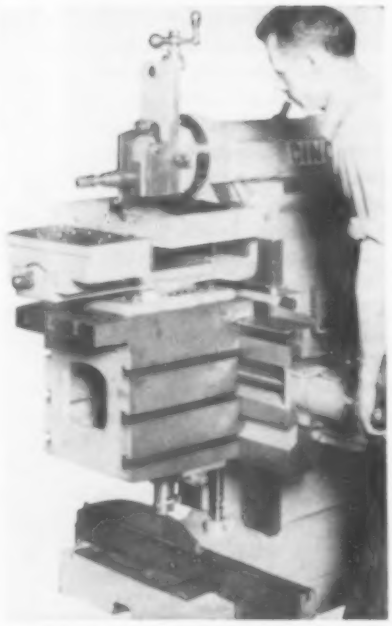
Available with late model Sunnen honing machines, these gages provide visual indication of stock removal and cutting action of stones; tells how much is left and when to gage for final sizing. Freely described in a bulletin, available on request. T-12-25

Micro Lapping Compound

A Boron Carbide Compound, announced by Scientific Abrasives, 540 W. Armitage Ave., Chicago 14, Ill., is designed for practical lapping and polishing procedures that, previously, have been considered feasible only with diamond abrasives. It is made with a high heat resisting synthetic base said to readily mix with oil as well as with water-mixed abrasives, if so desired. The compound is said to be particularly applicable to ripping, lapping and polishing cemented tantalum and tungsten carbide tools, wire drawing and cold header dies. Stock sizes are available in the 100 to 800 range. T-12-26

Follower-Type Shaper

A low-cost follower-type Shaper, for duplicating contours on metal parts, has been brought out by The Cincinnati Shaper Company, Cincinnati, Ohio. The shaper is standard except for the pad on the base, the masterform holder and a special table support post. Hence, the machine can be used for both regular shaper work and automatic duplicating.



The die illustrated is machined by feeding the tool slide down in consecutive cuts, for roughing. A final finish cut completes the surface. For more intricate contours, Cincinnati shapers may be equipped with a hydraulic follower which permits shapes to be cut with simple, single-point tools. **T-12-27**

Portable Thickness Gage

The Model 644 Portable Thickness Gage, by the Federal Products Corporation, 1144 Eddy St., Providence 1, R. I., is designed for rapid checking of sheet and strip stock. Its functions include: checking incoming material to insure receipt of proper stock sizes; assuring issuance of correct sheet thickness from stock room to shop; and measuring stock before and after plating operation to determine thickness of plating.

The gage is well balanced, with the retracting lever built into the handle in normal gripping position. The indicator may be furnished with a direct or continuous reading dial; however, the former is recommended by the maker for sorting purposes. **T-12-28**

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Hassall

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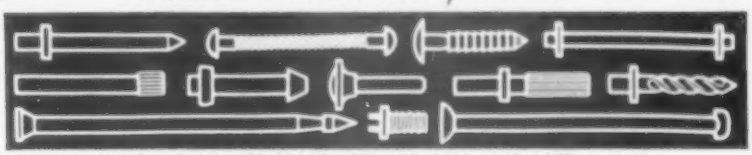

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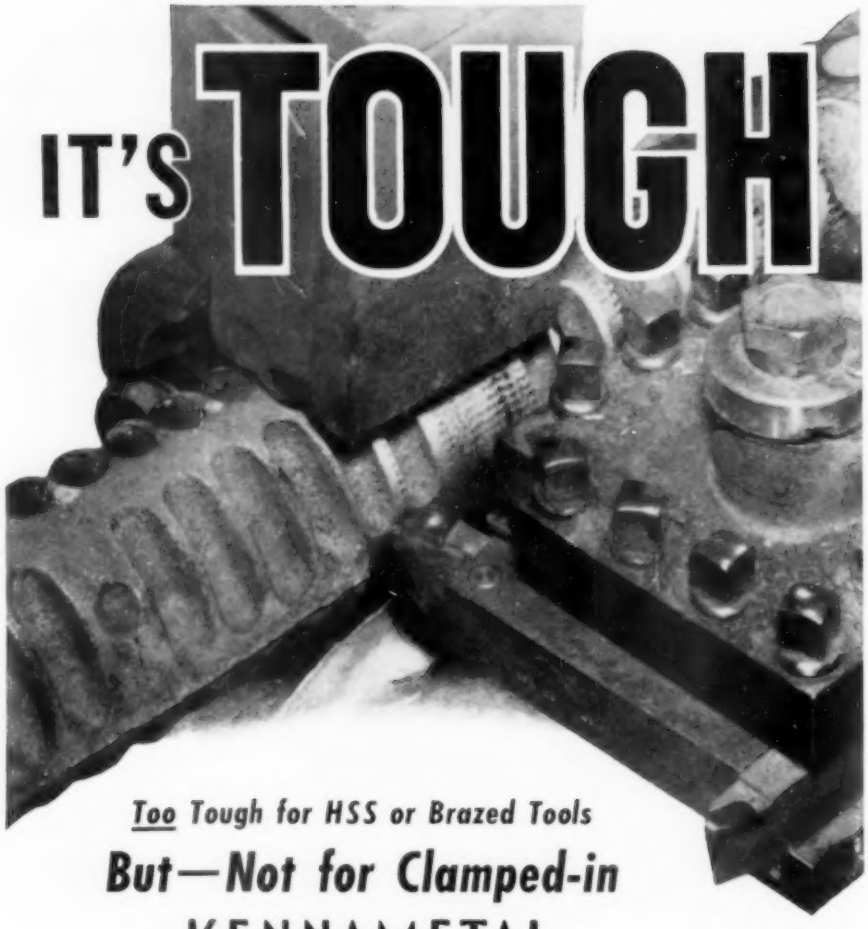
IT'S TOUGH



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But—Not for Clamped-in KENNAMETAL

This is a tough job—maybe you'd say, "not suitable for carbide tooling." It's a long, slender cast iron roll having rough, abrasive inclusions, and more interruptions than plane surfaces. The machine and the tool set-up, while adapted to make the best possible use of existing equipment, are far from ideal.

The job was too tough for HSS or brazed carbide tools—*but* not for sturdy Kennametal clamped-in K6. Here's the record: With Kennametal tools machining time is down 62%, production is up 45%, and tool grinding is down 99%. See particulars in table at right.

Your job may not be this tough. But consider this important point—a tool that takes tough jobs in stride is the one to use on routine production jobs where floor-to-floor time, uninterrupted machine operation, and overall cost per piece must be determined with accuracy, and maintained. That's Kennametal. Let us show you, in your shop.

The Facts

	HSS Tools	Kenna-metal
Feed	.030"	.044"
Cut	⅛"-¼"	⅛"-¼"
RPM	40	80
SFM	39	78.5
Mach. Time	39 min.	15 min.
Prod. 8 Hrs.	11	16
Pcs. Grind	Avg. 3	Avg. 350
Pcs. Tool	—	5250 (est.)
Tool Cost	—	$11.45
Tool Cost Pc.	—	$.0022

Are you receiving our technical bulletins on carbide tooling? If not, mail us your request for them . . . no obligation

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KENNAMETAL *Inc.*,
Latrobe, Pa.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY

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A.S.T.E. NEWS

(Continued from Page 59)

Warns Against Resetting Diamonds Too Frequently

Poughkeepsie, N. Y.—Too frequent resetting shortens diamond life, Harry L. Strauss, Jr., general manager of National Diamond Laboratories, Inc., New York City, told some 50 members and guests of Mid-Hudson chapter. Mr. Strauss discussed "Specifications and Uses of Industrial Diamonds" during an ASTE dinner meeting, October 10, at the Nelson House.

Changing Position Extends Life

Diamonds, he explained, should first be used on an angle, then in a vertical position, to obtain maximum life. When a stone becomes too blunt for efficient wheel dressing, it should be returned to the manufacturer for resetting. Diamond setting techniques named include brazing, casting, induction heating and powder metallurgy.

The speaker also described briefly the electrolytic method for drilling diamond wire dies, developed by the Bureau of Standards. With correct angles on a diamond tool, Mr. Strauss stated, a 1¼ mu. in. finish can be obtained.

Using slides, he showed that diamonds from the Belgian Congo appear to have an opaque coat, those from South Africa are glossy, while Brazilian stones are translucent. Diamonds which can be seen through are best, he added.

Mr. Strauss also described a method of turning carbide, entailing a special screw clamp of his own design. With this device, he claims more stock can be removed per cut than by grinding.

Prior to the technical talk, Frank L. Plotnik, a chapter member, entertained with harmonica selections.

'Precision Gaging' Packs Boston Technical Meeting

Boston, Mass.—A capacity audience of 256 members and guests enjoyed one of the best programs ever presented by Boston chapter, at a meeting October 5 in New England Mutual Hall.

The subject, "Precision Gaging Methods," featured talks by Clifford W. Kennedy, quality control engineer, Federal Products Corp., Providence, R. I., and James B. Wilkie, gage engineer, Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

Mr. Kennedy stressed the more elementary procedures of inspection by gaging, illustrating with anecdotes. "Often a new product is jeopardized by lack of adequate gages. Gaging should be planned along with other tooling and equipment," Mr. Kennedy stated.

When designing gages, he recommended, the operator should be considered. A gage that is not handy to use will be neglected.

Continuing the discussion, Mr. Wilkie described varied types of gaging installations. He showed slides of automatic gaging used in the Detroit automotive industries.

These applications he termed the ultimate in gaging technique, little used in New England because of the diversification of industry. Other slides demonstrated gaging in the ball bearing industry.

As gadget speaker, Hans Effgen, tool engineer of Globe Tool and Gage Co., talked briefly on tooling for production of a new line of hearing aids, with emphasis on special dies and methods used.

Chairman A. James Leone, presided. Floyd Dodge, chief engineer, Wade Tool Co., was technical chairman.

Industrial exhibits were shown by New England Carbide Tool Co., Packard Machinery Co., and L. W. Sheehy.

Material Handling System Speeds Daily Newspaper

Louisville, Ky.—A tour through a modern news gathering and publishing establishment highlighted the October 11 meeting of Louisville chapter.

Guides at *The Louisville Courier Journal & Times* escorted the engineers through the newspaper's recently completed building, housing offices, printing facilities, radio and television stations.

Starting in news gathering agencies, such as telephoto, telegraph, teletype, and telephone, the party proceeded to the composing room, proofreading department, and linotype machines, then to the casting of stereotypes from paper mats. They saw the cylindrical plates placed on platens in huge rotary presses that print, assemble, cut and fold newspapers at incredible speed.

The entire operation was implemented by the latest material handling equipment. An automatic conveyor system, used for moving newspapers to the mail room, held the interest of the visitors. A unique use of resistance welding on wire was demonstrated in packaging and bundling papers.

The evening tour followed a dinner and brief business session at the Kentucky Hotel.

Situation Wanted

TOOL AND PROCESS ENGINEER—Registered professional mechanical engineer, shop background, tool design and estimating. Age 31, minimum salary $7000. Box 222, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

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•RESULTS—

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Micro finish, concentric to tenths of thousands. Cuts freely and to size without burring or welding.

Solid Ground THREAD FORM
For angle and lead accuracy, eliminates gauging problems and control of pitch diameter to tenths of thousandths.

"Right" ROCKWELL
Taps pre-inspected for correct Rockwell hardness.

Mirror Finish FLUTES
Correct design to provide freer chip flow and longer tap life.

Tru-Square DRIVER
Square and shank fit correctly in chucks and holders. No wobble to cause oversize holes.

Measured results, however good, mean nothing to you unless they're applied to your particular tapping operation. Yet, Besly's proof of performance on helping others lower tapping costs, save time and labor, turn out close tolerance work to exacting specifications, on any material, can be your guide to better tapping results.

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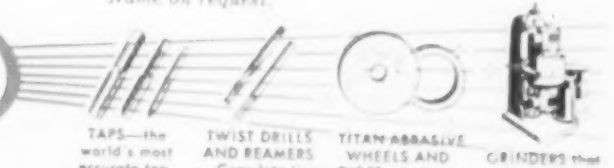

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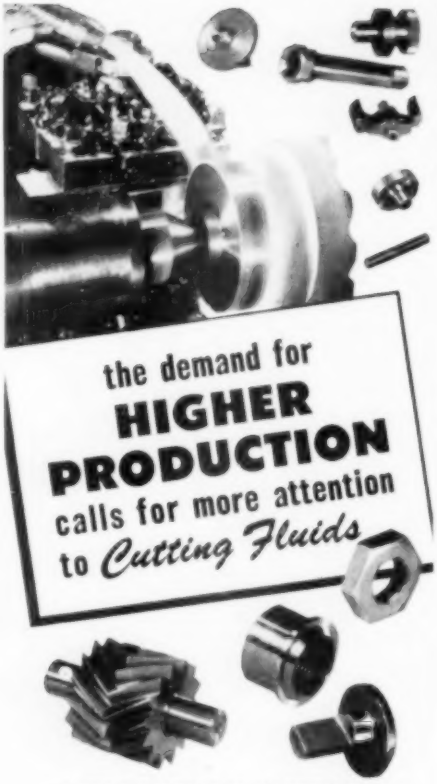

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• These are not isolated examples of how Stuart can help boost production. They are taken from daily field reports. Ask to have a Stuart Representative call.

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INDICATE A-12-76-1

North East West South IN INDUSTRY

John W. Thompson has been appointed production manager of **The Carpenter Steel Company** where he will supervise stainless, alloy and tool steel sales in addition to continuing his responsibilities concerning product development, advertising and marketing.

The board of directors of the **Bay State Abrasive Products Company** has voted an appropriation of $100,000 for factory expansion, supplementing the $250,000 program now being carried out. Contracts for the additional work, already released, include work on additional 6,400 sq ft of factory space to house a tunnel kiln.

According to a recent announcement, **Frank R. Simpson** has been appointed director of research and development for **The Kuljian Corporation.** For the past eight years, Mr. Simpson has directed research projects for the Franklin Institute of Philadelphia.

H. Sturgis Potter has been appointed general sales manager of **The Carpenter Steel Company** to succeed R. V. Mann who, until his recent death, was vice-president in charge of sales. Mr. Potter has been associated with Carpenter for more than 14 years.

Lewis John Firth, last of the steelmaking group who pioneered the American tool steel industry, died recently after a long illness. Mr. Firth remained president of **Firth Sterling** until 1937 when he relinquished the post to his son and became chairman of the board of directors until his retirement from active business in 1944, at the age of 86, after having completed 70 years in the industry.

A. Alven has been appointed general sales manager for **Lipe-Rollway Corp.** Mr. Alven adds this position's responsibilities to those he already carries as general sales manager for Rollway Bearing Co., Inc., a subsidiary of Lipe-Rollway.

Several administrative appointments recently announced at Carboloy Company, Inc., included **I. L. Wallace,** formerly superintendent of the carbide metal division, as manager of engineering on both carbide and other special metals; **J. A. Muldoon,** formerly superintendent of the carbide fabricating division, who was made manager of manufacturing for carbides and special metals; and **R. L. Brownless** who had been production manager on carbides, was named manager of manufacturing for other special metals. **F. C. Ritner,** it was revealed, will assist the executive vice-president in administrative capacity in addition to his present responsibilities as vice-president in charge of research.

The **Roto-Finish Company** of Kalamazoo, Mich., is nearing completion of the new addition to its present plant. The larger unit is expected to greatly increase the Roto-Finish processing machine facilities.

The re-election of **F. M. Hawley** as president and general manager was announced following a recent meeting of the board of directors of **Morse Chain Company,** division of **Borg-Warner Corporation.**

Among other appointments also announced were **J. N. Candler,** formerly administrative assistant to Mr. Hawley, as vice-president and assistant general manager; **R. J. Howison,** formerly general sales manager, was made vice-president in charge of sales; **E. W. Deck,** who was manager of the Ithaca plant, becomes vice-president in charge of manufacturing at Ithaca, and **M. V. Durkin,** former manager of the Detroit plant, was chosen vice-president in charge of manufacturing at Detroit.

At the same time, **W. M. Reynolds** was appointed secretary and treasurer and **E. G. Wuensch** was named assistant treasurer, while **V. P. Burgess** was reappointed assistant secretary.

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INDICATE A-12-76-2

Herbert J. Werner has joined Columbia Machinery and Engineering Corporation as chief engineer of the mechanical press division. Mr. Werner has been prominent in the metalworking field and for his work in mechanical and hydraulic press engineering.

In the announcement of a number of changes in executive positions at Doehler-Jarvis Corp., Charles Pack was named vice-president in charge of the newly formed engineering and research department. Mr. Pack previously was vice-president in charge of production. W. G. Gutmueller, formerly vice-president and secretary of the company, was made vice-president and production manager; Louis Miller, director of labor relations was appointed assistant vice-president of the corporation; and Harold L. Samuels, formerly assistant secretary, was named secretary of the organization.

Frank U. Hayes, sales manager of The Bullard Company, has been elected a director of the company to succeed E. P. Blanchard who retired recently. Mr. Hayes has been associated with Bullard since 1935.

Austin C. Ross, manager of the Buffalo works of Worthington Pump and Machinery Corporation, was elected a vice-president of that company at a recent meeting of the board of directors. Mr. Ross will continue to serve as Buffalo works manager.

A. L. Carr has been appointed as vice-president and director of sales for Morse Twist Drill & Machine Co., to succeed J. C. Kuhn who has retired from active business life.

Mikron, S. A., of Bienne, Switzerland, manufacturers of precision hobbing Machines have appointed Russell, Holbrook & Henderson, Inc., as their American representatives.

Coming Meetings

Jan. 15-18, second Plant Maintenance Show and conference: Auditorium, Cleveland.

Jan. 18-20, seventh annual National Technical Conference, Society of Plastics Engineers, Inc.; Hotel Statler, New York City.

OBITUARY

Ernest V. Moncrieff, former president of Swan-Finch Oil Corporation, died recently at the age of 60. Mr. Moncrieff had been associated with Swan-Finch for 35 years, serving as president from 1930 to 1948. He also was a past president of the National Lubricating Grease Institute.

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NEW REAMING INSTRUCTION CHART
Determines feed and speeds for cutting steel, ferrous, non-ferrous and non-metallic materials. Write WENDT-SONIS COMPANY, Hannibal, Missouri.

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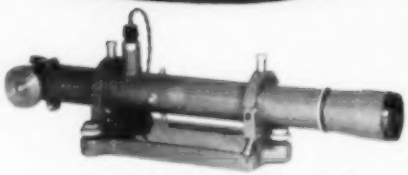

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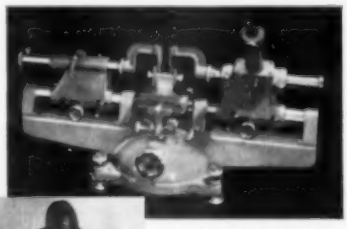

WATTS HORIZONTAL MEASURING MACHINE — direct reading without gage blocks, for internal and external measurement.

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INDICATE A-12-78

Abstracts of Foreign Technical Literature

By M. Kronenberg

England: A continuous series of articles on "*Productivity in British Industry*" has been published for the past nine months in "*The Engineer*" with contributions by 13 different authors covering various aspects of this topic. F. A. Martin contributed an article dealing with "Threshold of Productivity." Sir C. Gibb wrote on "Productivity and Cost" while "Standardization in the Aircraft Industry" was covered by E. C. Bowyer. An article on "Research for Productivity" was prepared by Dr. D. F. Galloway, and "Mechanical Handling" discussed by F. Garner. Tool engineers will also be interested in the article by F. V. Everard on "The Importance of the Craftsman" and in the contribution by A. Vickers on "Productivity in Smaller Engineering Works."

The last article, published in the October 13 issue, by L. H. C. Tippett on "Measurement of Productivity" gives a survey over the various difficulties involved in comparing productivity of different companies or different countries. He found that on a broad basis, the existence of a much higher productivity in USA than in England has been established. Productivity is usually measured as the output of the production unit (factory, industry, etc.) for a given period, divided by labor time (man-hours). It is however necessary to define carefully such concepts as labor time and to investigate whether labor by administrative and supervisory staff should be included. The definition of output is still more complex, and it is necessary to reduce products over a sufficient range to a common measure so that useful comparisons can be made. No such thing exists as productivity in any absolute sense. It can only be defined and measured according to selected standards. In the interpretation of productivity considerations arise such as the fact that coal is easier to win from American than from British mines, or that one unit may have a higher productivity than another one because it makes larger quantities of a narrower range of products.

Switzerland: The problem of tool life is closely related to a criterion for tool wear and to finding a means for determining the instant when a tool is to be considered dull. E. Bickel in "*Industrielle Organisation*" indicates that our present methods for determining tool life are not satisfactory in the case of sintered carbide tools. While the appearance of a burnished surface on the workpiece usually was a good means for determining the end of the usefulness of high speed steel tools, such phenomena are not encountered with sintered carbides. In the case of mass production it may sometimes be sufficient to run a number of production tests at different speeds and feeds until the correct tool life is found. Such a method would be too costly and take too much time, however, for the average shop where we have production in lots or even sinigle piece production. These cases occur very often in Switzerland and also to a considerable extent in the United States.

Bickel submits that international standards should be developed for tool life tests which can be used by the man in the shop and also in scientific research as necessary for the further development of tool engineering. He compares, very correctly, this job with developments in the field of testing elasticity, where it is possible to predetermine within a small tolerance the stresses and strains set up under a given condition, while it is very difficult to predetermine the machinability and tool life of our work materials.

Germany: A survey of the entire field of powder metallurgy can be obtained from the recently published fourth edition of "*Metallkeramik*" by Franz Skaupy. This book covers the scientific principles, technical details of production, design of sintered carbide tools, high temperature alloys, porous bearings, electrical contact material and many other items. An extensive list of patents in powder metallurgy completes the content.

A large sector in the field of standardization which has hardly been touched on in this country, although well established for many years in Europe, is discussed in a new book by Otto Kienzle, published by Julius Springer. It deals with "*Normungszahlen*"; that is with preferred numbers for dimensional standards as used in the ratios of transmissions in machine tools, or in the sizes for commercial letterheads, and in numerous other cases where a series of similar parts shall be standardized. The basis of these preferred numbers is the $\sqrt{10} = 1.25$ used for geometrical similarity. In the first part of the book, the author discusses the economical and practical reasons for many European countries to adopt such a system of preferred numbers. In the second part he indicates how the rules of standardization based on the above value of geometrical progression are applied and have been successfully used in Germany.

Honing of cemented carbide tools is the topic of an article, published in Werkstattstechnik und Maschinenbau, September, 1950, by H. H. Finkelnburg. The author indicates that a well-rounded tool nose on a lathe tool has a great significance and effect on tool life. The intersection of the main cutting edge and the secondary cutting edge of a

lathe tool is usually the point of highest stress but also the point which is least supported if not correctly ground. The tools wear here first, the heat conductivity is worst at the nose and a breakdown of the point is usually accompanied by a change in dimension of the workpiece.

Hand grinding of the nose radii of sintered carbide tools is not satisfactory and a machine has been developed which grinds a proper radius in such a way that the point will be well supported by the shank. Among the difficulties of grinding and lapping of cemented carbide tools is the lack of sparking of the work when lapped with a diamond wheel. The operator therefore does not know what pressure he exerts on the tool and consequently often overheats and cracks the tips. Diamond wheels have recently been developed where the rim is spring supported. It is claimed that such wheels are easier to handle because any excessive pressure when lapping a tool is transmitted to the springs, which yield and thus reduce the pressure on the tool.

Grinding of optical glass is discussed by K. Georg in the September, 1950 issue of Werkstattstechnik & Maschinenbau. The author, who is associated with a large optical company in Germany, gives interesting details and indicates the similarity of many problems encountered in lens manufacturing with those faced by tool engineers in metalworking plants.

The direction and magnitude of the cutting force is an important factor in predetermining cutting speed and feed for the grinding process, while the hardness of the glass is the main factor affecting surface finish. The diamond tools have an average work surface of 3 to 4½ square inches, for which about 5 to 10 carats of diamonds are required. It is possible to grind a surface of approximately 450 to 600 square inches of glass with one carat.

The glass removal with cup wheels lies between 0.01 cu in. per minute and 0.03 cu in. per minute. With cylindrical wheels the glass removal averages 0.025 cu in. per minute. Glass sawing is done at a rate of 0.18 cu in per minute.

A surface finish between .000280 and .000640 in. can be obtained when grinding optical lenses (spherical surfaces) with cup wheels, depending on the hardness of the glass. In the case of grinding plane glass surfaces, the accuracy is higher namely between .000200 and .000400 in. With cylindrical wheels the surface finish lies between .000640 and .001000 in.

Special spindle bearings are required for grinding and polishing machines for lenses. The speed is reduced about 50 percent in the case of polishing which is done with tar covered shell-like tools. The pressure when polishing depends again on the hardness of the glass and varies between 0.2 and 1.4 lb/sq in., but is only half these values for grinding of glass.

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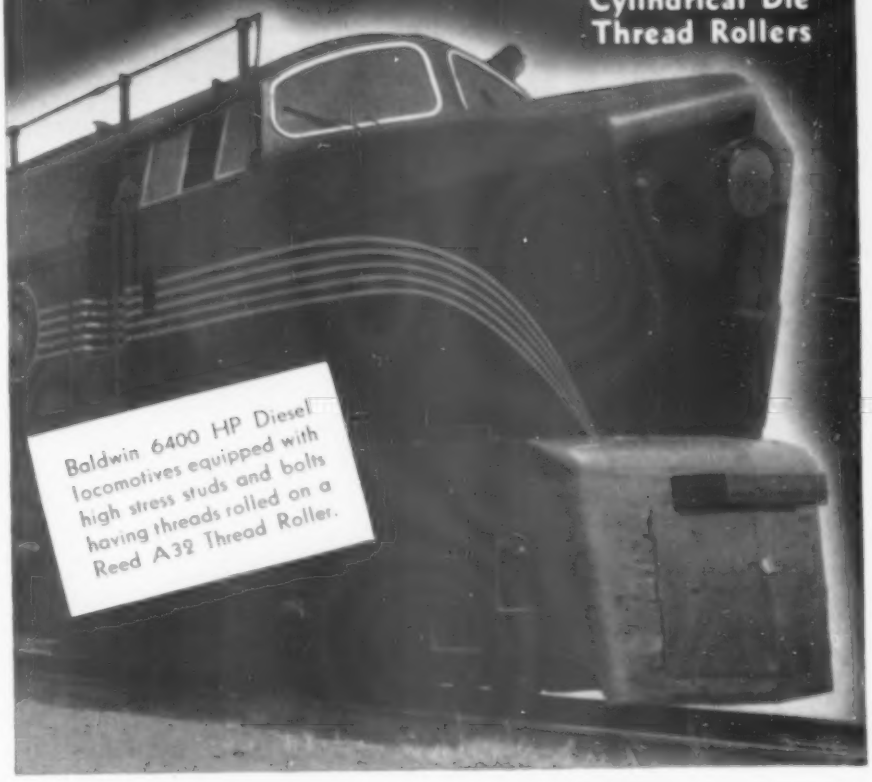
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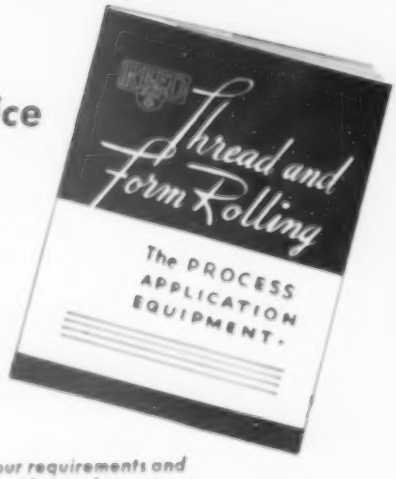

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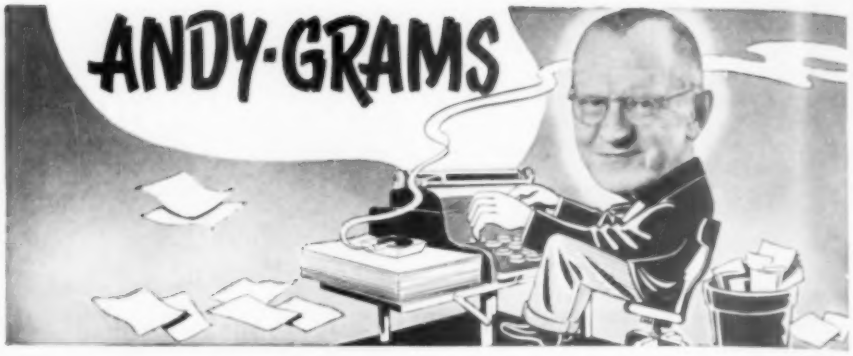


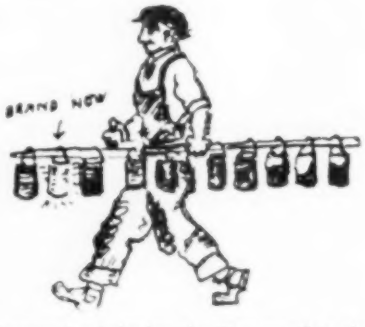
Back from California to resume wonted chores, found stacks and stacks of mail including birthday greetings with, as usual, a card from John Sylvester. Also, greetings from several of the Directors, convened during my absence. Here's to you!

About that letter re "nailing tea can to the bench", October A/G, I can now say that my correspondent was R. Jenks from Bombay—and thanks, Ralph, for starting off some interesting letters, as below:

Dear Andy:
. . . re "nailing the tea can to the bench" leads me to think your correspondent is a Scot, the term being well remembered by the writer who was raised along the Clyde—once the world's shipbuilding center. To translate the "tea can trick" we go back a bit when fitters and turners (machinists) carried a 2-sectioned tin holding dry tea and sugar. This was picked up around tea time by an apprentice (see sketch) who boiled water in the can, dumped in the dry tea and delivered the "brew" to the men along the bench. Some jokers . . . would drive a nail thru the bottom of a can . . . the laugh came when the victim reached for a "slug" of tea only to find the can stuck to the bench . . . then getting mad enough to yank the * can loose only to get his pants full of tea as the can pulled apart. As a parallel story, we'd line up our sandwiches on a plank for the blacksmith—Andy Thamson—to toast. One fellow, without "if you please", crashed the line out of turn. Andy passed the red hot slab of iron carefully over preceding sandwiches but —plop, sizzzz!—accidently (?) dropped the hot iron right on the offender's egg sandwich. Needless to say . . . the fellow got in line. Andy was a rough old Scot and like . . . yourself had a way of making his points stick.

Best o' luck,
Bob Kerr (Philly chapter)

*censored.



Apprentice bringing the "tea cans" to the gang. Original drawing by Bob Kerr.

Dear Andy:
Re "tin can to bench" . . . in my young days we started work in England at 6:30, worked to 8:30, then had breakfast. Tea made in a tin can, the water boiled by plunging a red-hot bar into it, first knocking off the scale . . . as water was added the tea (?) got weaker and weaker. . . . Sometimes the can was nailed to the bench. We worked from 6:30 to 8:30; 9 to 1; 2 to 5; 5:30 to 6:30. Some day, those days—phooey! Always enjoy your Andygrams.

Sincerely,
Tom C. Plumridge
(Chicago chapter)

Yes, I had a taste of "them days", too. At my first job the hours were 6:30 A.M. to 6:30 P.M., with a half hour for lunch. Later—as at Brown & Sharpe's and Taft-Peirce—we worked only 10 hours plus overtime. We carried coffee in pint bottles, heating it by suspending the bottles in the soda water kettles. An Englishman of my acquaintance would mix tea, sugar and condensed milk into a paste, wrap it in a newspaper and drop it into water heated by live steam. I tried it once and it tasted almost like tea—mixed with printers ink. Maybe that started me writing.

Dear Andy:
Noted with interest the excerpt of Nils Goodrich's letter in your November column. As Nils is a Chicago member, any development of a chapter in Sweden will be of close interest to our constituents. Incidentally, your column often alludes to an individual, such as above. Where such . . . is a Society member, wouldn't it be a good idea to also note the chapter affiliation? Have a good vacation, but don't get so engrossed in nuts that come in shells that you'll have everybody getting their threads crossed.

Regards,
Thomas C. Barber,
Chairman, (Chicago chapter)

Now there, we got something! Like I've always said, this is a friendly and democratic Society, so of course we should have constituents. Eh, fellow citizens? With regard to Nils Goodrich, Chicago or Sweden, what's the difference? (By the way, Tom, it wasn't them kind of nuts.)

A note from Jimmy Giern, anent his "engineered" pipe, mentioned in the October column and also subject of a feature story by Doris Pratt in the ASTE News:

Salutation and thanks . . . the ambiguity of correspondents who do not peruse that which they would reply to. Like the man in . . . who read the Andygrams and offered us space to advertise out *gaspipe*

Also, a note from Herr H. Häggstrom, editor of *Verkstäderna*, Stockholm who, among other things, states that: "We also enjoyed your friendly letter to Mr. Josef V. Stalin." Thanks to all above for contributing material to my page, thereby helping to make it more interesting besides saving me from thinking—the latter an ordeal to me as to most people.

Since my return, people have been asking me what I think of California, and I can only say that the people are swell and the climate wonderful. However, influx of immigration taxes immediate employment openings for all but highly trained technicians and professional workers—and here, the demand is for young men.

Despite that, the more hard-headed Californians seem to have reversed Horace Greeley's slogan and now advise youngster to "go east, young man." However, the Coast has unlimited possibilities for industrial development; yet, in my belief—and I refer especially to the San Francisco area—industry is not taking full advantage of the production know-how which is so evident in the local ASTE chapters. As for moving out there . . . well, if you've money to retire on, or to start a business—swell! If not, it would be well to look before leaping.

Here's a funny one. Sitting in the observation car on the return trip, and approaching Chicago, a fellow passenger asked if my name was Rylander. On my affirmative and somewhat surprised reply, he introduced himself as Paul Hellman, ASTEer from Los Angeles chapter; said he recognized me from the picture on the title block, above. Must be a good picture!

From one thing to another, hopes of a quick conclusion to the Korea incident seems to be deferred—and hope, as the poet said, "maketh the heart sick." But, thanks to our Allies in the UN, we'll make it, in the meanwhile hoping that our diplomats (?) may evince the brains to match the valor of our fighters so that, somehow, we achieve a lasting peace. In this connection, I was highly pleased that Dr. Ralph Bunch—mentioned in a previous Andygrams—was awarded the Nobel peace prize.

Well, another election is over, and from my viewpoint the results are good. Goes to show that when things go sour people in a free democracy exercise their right to franchise and do something about it. Too bad, at that, that we have to wait until it gets worse before taking action.

And now, the Holidays approaching, I take pleasure in once again wishing our members and friends North, East, South, West a Merry Christmas and a Happy New Year. May the ideals we strive for be realized so that we may knit the closer in bonds of friendship and understanding.

ASTEely yours

Andy

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Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

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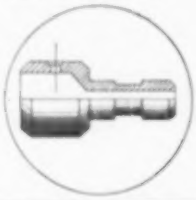
Crossdrill and C'T" Sink 1/16" Hole

Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine



TAPPING

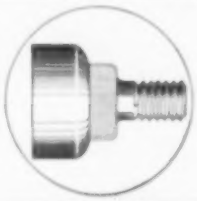
Tap Two #10-32 Holes

Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine

THREADING

3/8"—24 Thread—1/2" Long

Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



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If you keep track of the condition of your tools by gaging the parts produced, you're likely to get some off-size pieces before resharpening. This is because, when a cutting edge or grinding wheel starts to grow dull, clean cutting action ceases and the metal begins to be ***torn*** off. ***Once begun, this effect increases rapidly,*** often leading to off-size work before it is detected by dimensional measurement.

If, instead, you resharpen on a fixed-schedule basis, you again run the risk of loss. If the schedule is based on using a ***normal*** tool or wheel, one that is even slightly defective will produce rejects before resharpening. Unexpected changes in hardness of metal or in other operating conditions may also cause premature dulling, with the same result. If the resharpening schedule includes a factor of safety to allow for such possibilities, most of the time resharpening will be done more frequently than necessary, thus shortening total tool life and increasing your down-time.

To avoid these difficulties—to get maximum production with maximum tool life and minimum rejects—more and more companies are using the Profilometer to detect the dulling of tools and wheels. This is how it is done:

As tools and abrasive grow dull, the cessation of clean cutting action (mentioned above) increases the normal point-to-point variation in the ***surface roughness*** of the work. This takes place just before ***dimensional*** errors occur. ***By taking occasional roughness readings with the Profilometer on the parts as they come from the machine, the operator can quickly tell the condition of his tools or wheel. When the point-to-point roughness increases, he knows it's time to sharpen his tools or dress his wheel.***

Using the Profilometer, this simple shop procedure can be applied to any machining, grinding or finishing operation on practically any surface. The initial cost of the Profilometer is soon repaid by the savings effected thereby; and that is only one of many practical applications. ***Write for further information***—and arrange for a demonstration in your plant.

Profilometer is a registered trade name.

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TECHNICAL SHORTS . . .

A five-day seminar aimed at assisting manufacturing concerns in the organization of their standardization work will be held from January 22 through 26 in the Engineering Societies' Building, New York. The seminar, specially designed for company representatives, will consist of ten conferences, comprising a lecture by Dr. John Gaillard, mechanical engineer, American Standards Association, and lecturer at Columbia University, followed by round-table discussion of problems of interest to those attending.

Details and registration information may be obtained from Dr. Gaillard, 400 West 118 St., New York 27.

The United States faces a potential shortage of engineering graduates, thus inheriting a threat to its security, international peace and economic progress according to Dr. William C. Knopf, Jr., assistant dean of the Technological Institute at Northwestern University and recently elected chairman of the Illinois-Indiana section of the American Society for Engineering Education.

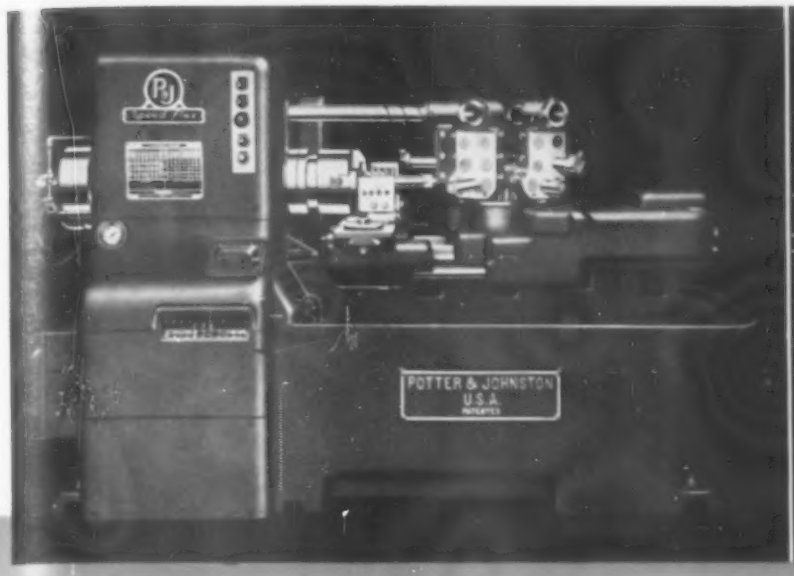
Dr. Knopf pointed out evidence from recent reports showing that virtually all graduates from last June, although an especially large number, have been absorbed quickly into industry. Also, the sharp reduction in the numbers of prospective engineering graduates indicates a 60 percent decrease in those entering the field in 1953.

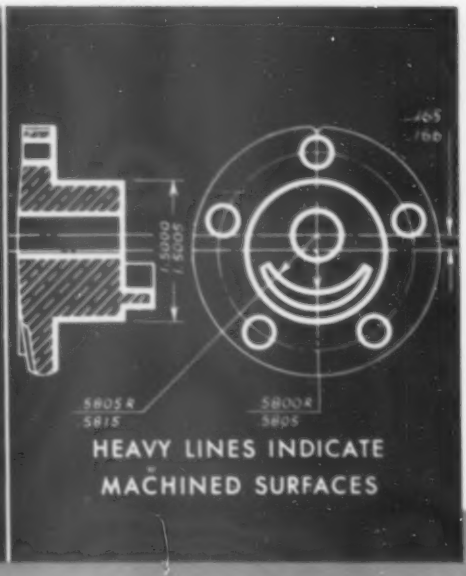
A recently introduced liquid phenolic casting resin called "8000" Tool-Plastic is being manufactured for Rezolin, Inc., by Durez Plastics & Chemicals, Inc. Outstanding advantage claimed for the item is the elimination of shrinkage and the way it lends itself to economical production or duplication of tools and models without need of elaborate shop equipment and especially skilled personnel. In addition, dimensional stability of the cast tool or model is said to be high. The plastic model is said to be high. The plastic is used with an accelerator paste which comes in two forms so that it may be used for repair work or emergency production, or for standard operation.

The first published edition of the American Standard Compressed Gas Cylinder Outlet and Inlet Connections, B57.1-1950, is now available from the American Standards Association.

The standard, developed by the Valve Thread Standards Committee of the Compressed Gas Association, recommends detailed dimensions for all elements of valve outlets of compressed gas cylinders and their connections. In order to prevent unintentional or dangerous cross connections between gas cylinders and outlets for different g[illegible]

(Continued on page 84)





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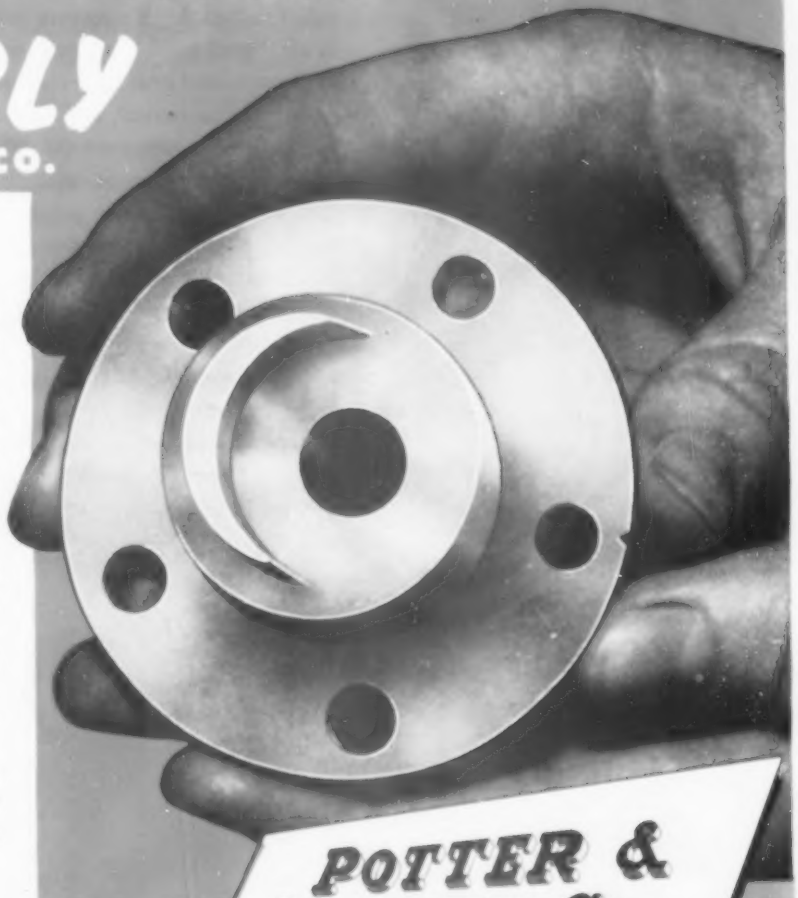
The P&J 3U Speedflex Automatic Turret Lathe has proved itself a most efficient tool to perform some 21 precision operations in record time on this pump part, *including the eccentric bore and the simultaneous drilling of five holes.* It's the finest of Automatic Turret Lathes for profitably machining small castings *and* forgings.

Set up with skillful P&J-engineered Tooling, it produces better work, and more of it with fewer rejects. It increases productivity by combining cuts and eliminating extra work handling. It reduces labor costs because one operator easily handles a battery of these fully automatic, high speed Machines. P&J will gladly estimate on *your* small parts production; simply send us sample parts or prints.



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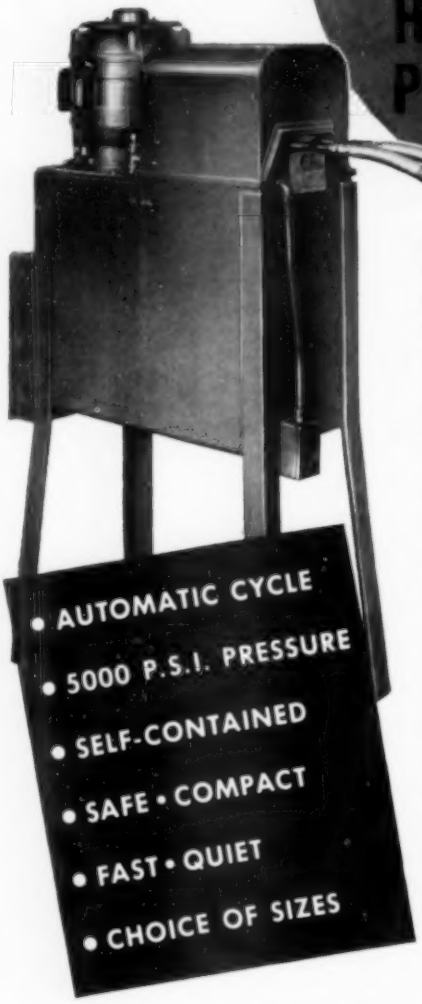

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Technical Shorts . . .

(Continued from page 82)

threads on the outlets are separated into four basic divisions—internal and external, as well as right-hand and left-hand. Within each of the four divisions, further separation is made by varying pitch and diameter of threads which are so spaced that adjoining sizes either will not enter or will not engage.

The published standard, available for $1.50, gives a numbering system for the valve outlet connections along with 68 applications of these connections for various gases.

Another standard, B6.10-1950, recently approved by the American Standards Association, covers gear nomenclature, terms, definitions and illustrations. It was prepared by a committee representing manufacturers, users and independent experts in an effort to help bring about use of uniform terminology in offices, shops and textbooks, and provides a system of terms and their meanings grouped as a logical series rather than in alphabetical order. It also includes illustrative figures which may be referred to in investigations and discussions of gear problems.

The committee which developed the standard was jointly sponsored by the American Gear Manufacturers Association and the American Society of Mechanical Engineers under the procedures of the American Standards Association. The material is available from either ASME or ASA, at $1.75.

Engineering Experiment Station Circular 51, "Holdings in the A. F. Davis Welding Library" has been published by The Ohio State University department of welding engineering. The circular, available at slight cost, contains a bibliography of the more than 1,000 books, manuscripts and papers on welding techniques, procedures, designing for construction, metallurgy and other works pertinent to the field.

In addition, a second bulletin, No. 140, classifies copies of some 10,000 patents concerning equipment and applications on file in the library. The collection is said to make up one of the most extensive available in the Middle West as reference aid to patent researchers.

The Library was named for its donor, A. F. Davis, vice-president and secretary of the Lincoln Electric Co.

"This Moving World", a three-reel 16 mm technicolor film sponsored by the Malleable Founders' Society, tells the story of malleable iron. Narration is by Edwin C. Hill, radio commentator.

The film, which shows how the metal is made, tested and used, presents views of plants where the iron alloy is made tough and ductile by heat-conversion process, and further demonstrates principle properties and variety of industrial uses.

Available from Association Films, Inc. it may be borrowed free of charge from several of the association's exchanges.

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2. **Expert engineering assistance** the country over—completely unbiased because Norton has *all* types of wheels for carbide grinding.
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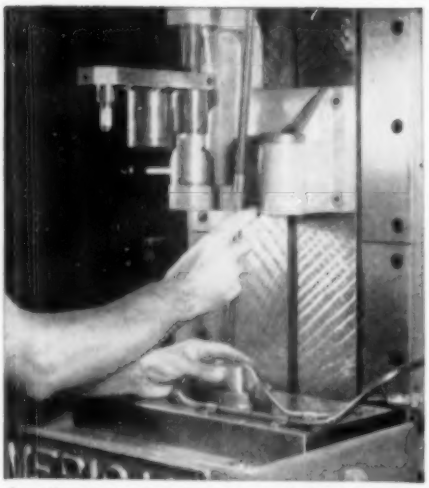
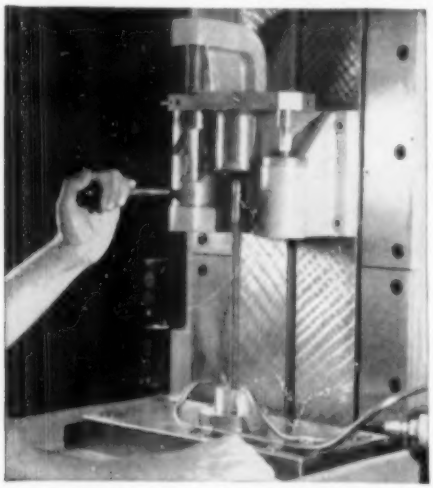
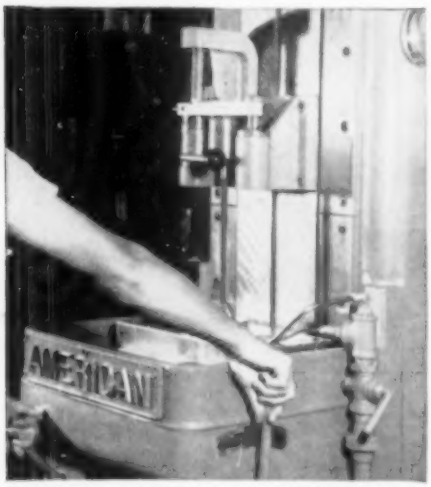


Part locates in work nest—broach shank is manually placed through part into pull head, then...



leaf assembly is swung into position with guide bushing over broach rear pilot. Cycle . . .



is started manually. At end of stroke, guide is swung out—part is unloaded—broach is then returned to up position. Production rate—100 per hour net.

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Finish broaching an involute spline through the center of Pump Rotor performed on American T-6-24 3-Way type Vertical Hydraulic Broaching machine arranged for pull down operation.

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Write for Circular 100. It describes in detail the design features that make the American 3-Way broaching machines a profitable investment. Fully illustrated and FREE. Address Department T.

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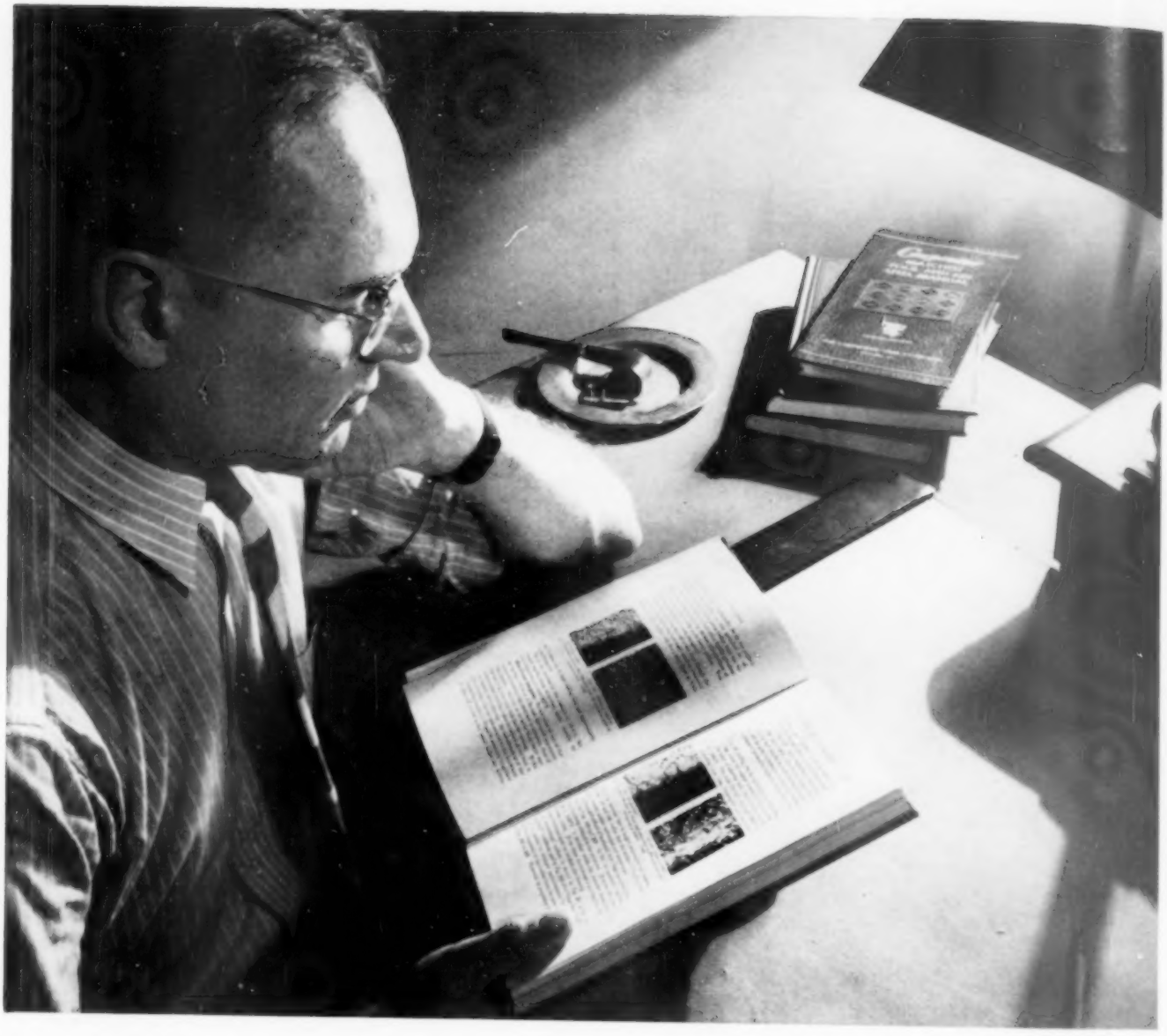

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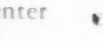
Even if you think all tool steels of "similar" analysis are alike, consider this: Here's a "plus alloy" that never appears in a type analysis—yet it has *proved* its ability to raise output per grind, reduce hardening hazards, and make dies less troublesome!

The men in the Carpenter Mills, where the "alloy" originated years ago, can explain it better than we. They will tell you it's an alloy made of patience, and care, and years of skill spent working with quality controls and modern equipment. It's the extra time invested in painstaking tests to insure uniformity. It's the *personal* attention lavished on every bar of Carpenter Matched Tool and Die Steel.

And it has paid off a hundredfold for tool steel users like yourself!

It's yours at no extra cost—let it work for you. Try a Carpenter Matched Tool and Die Steel for only one or two jobs. We'll let your results prove the difference. The Carpenter Steel Co., 154 W. Bern St., Reading, Pa.



Torsion Impact Test—One of many Carpenter quality controls that packs greater safety and dependability into each bar you use. The knowledge derived from this test enables you to heat treat the steel with greater confidence that it will give you the best combination of hardness and toughness.

Begin *now* to get more production from present equipment . . . ask your Carpenter representative for this new 189-page Carpenter Matched Tool and Die Steel Manual.

Export Department: Woolworth Bldg., New York 7, N.Y.—"CARSTEELCO"

Carpenter

MATCHED TOOL & DIE STEELS

—containing the one "alloy" that has no price tag!

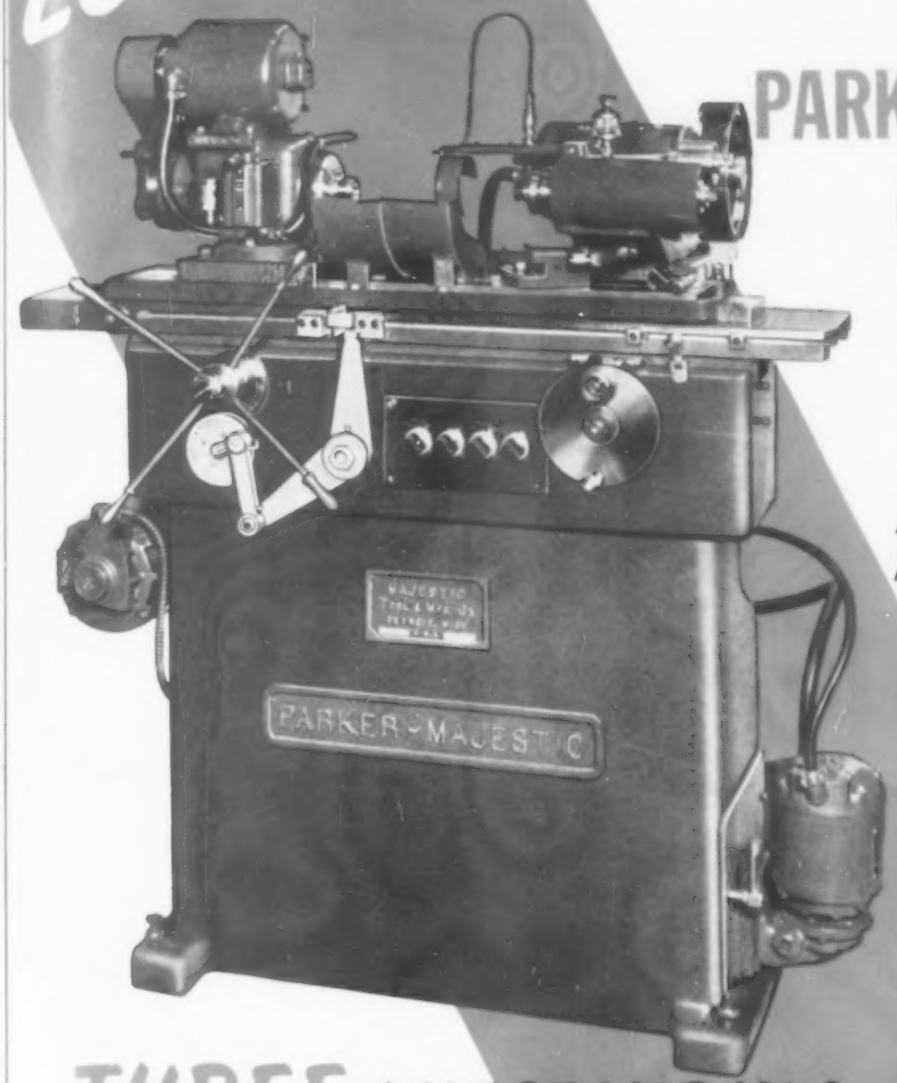
To get started now, just call Carpenter. Warehouse stocks in principal cities throughout the country.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-12-88

FOR ECONOMY

PRECISION MACHINES PM PARKER · MAJESTIC

The PARKER-MAJESTIC GRINDER Gives Smoother Performance



THREE OUTSTANDING ADVANTAGES GIVEN BY THE NEW PARKER-MAJESTIC OSCILLATOR

1. Positive Mechanical Operation.
2. From 0" to 3" smooth table travel.
3. Rapid and accurate table movement in any desired position.

This oscillator is optional equipment on all models of Parker-Majestic Internal or External Grinders.

PARKER-MAJESTIC, INC.

MFD. BY Majestic Tool & Mfg. Co.

147 JOS. CAMPAU • DETROIT 7, MICHIGAN

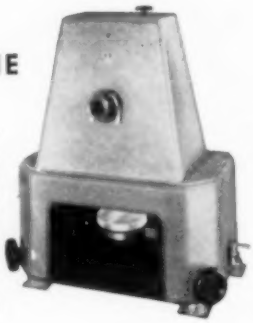
LOWER COSTS OF PRODUCTION OF INSPECTION

WITH THESE
BAUSCH & LOMB PRECISION INSTRUMENTS

STEREOSCOPIC WIDE FIELD MICROSCOPES

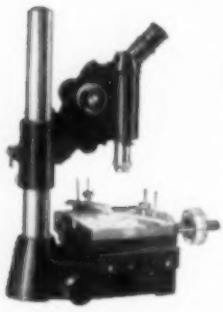
You save time and money by achieving greater speed and precision accuracy in small parts assembly operations . . . and in inspection of tools and finished parts . . . with this sturdy, dustproof instrument. *The finest optics ever produced for wide field work* assure you of accurate results. You get clear, sharp, three-dimensional images, and a *wider critcal focus than ever before*. The *unreversed* magnified image is more easily interpreted by the average user. These microscopes are extensively used in industry, with fifteen different models available for a wide range of applications. Catalog D-15.

New PARA-PLANE GAGES



Now you can have "laboratory" accuracy of 0.000001" in the determination of flatness and parallelism of reflecting surfaces . . . with production-line *simplicity* and *speed*. So simple that an unskilled operator can make measurements after a few minutes of instruction.

Two sizes of Para-Plane Gages are available. *Bulletin* D-224.



TOOLMAKERS' MICROSCOPE

Linear measurements to ±.0001", and, when fitted with a protractor eyepiece, angular measurements to ± 1 minute of arc, can be made with this sturdy microscope. Operation is extremely *simple* and *fast*. Opaque and transparent objects of any contour can be measured. *Catalog* D-22.

CONTOUR MEASURING PROJECTOR

No other projector can match its accuracy (angular measurements to ± 1 minute of arc with a protractor screen, and direct linear measurements to ±.0001" over a range of 4" x 6" with the cross slide stage.) Dimensions, angles, and profiles of production-run parts can be compared directly with a *traced outline* of the projected image of the master part, or with a large scale drawing superimposed on the screen. Inaccuracies are found quickly . . . simply.

WRITE for complete information on these five important optical aids designed to help you save time and money. You may be paying many times over their cost in lost time and rejects. Send your request to Bausch & Lomb Optical Company, 763-X St. Paul Street, Rochester 2, New York.

BAUSCH & LOMB
OPTICAL COMPANY ROCHESTER 2, N.Y.

. . . and you, too, can do it faster, better and at less cost with a Standard Red Shield Drill. No matter what you have to drill—iron, steel, brass, copper, aluminum, plastic—we have a Shield Brand Drill especially made for the job.

Shield Brand Drills—like all the Shield Brand Tools—are Foremost Quality in design, construction, workmanship. Our Service Men have the benefit of over 69 years' accumulated experience in solving tough drilling, reaming and metal cutting problems. Their advice and suggestions are gladly given *without cost or obligation.* Leading Industrial Supply Distributors coast to coast will look after your requirements for Standard Shield Brand Tools.

STANDARD TOOL CO. CLEVELAND 4, OHIO

New York • Detroit • Chicago • San Francisco

THE STANDARD LINE: ***Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools***

A rugged "STELLITE" TOOL produced this CHIP

ACTUAL SIZE

FROM A ROUGH CASTING THAT AVERAGED 250-330 BRINELL

This extraordinary chip was produced by a HAYNES STELLITE tool. It was formed during a machining operation that in less than 5½ hours removed half a ton of metal from the gate end of a rough casting. The casting was of air-hardening ordnance steel and had a Brinell hardness between 250 and 330. While this is an unusual example, it gives a good idea of how efficiently HAYNES STELLITE cobalt-base alloy tools can cut metal.

The metal removal rate was fast. The feed varied from 0.040 to 0.060 in. per revolution during roughing. Depth of cut was sometimes greater than an inch. To take a bite like that, a tool needs both toughness and red hardness. Some of the tools used on this job removed as much as 280 lb. of metal per grind.

The shiny underside of the chip gives a good idea of the finish that can be produced with HAYNES STELLITE tools, even though this operation was rough turning. Because they are tough, HAYNES STELLITE tools can be designed with comparatively large cutting-edge angles and nose radii. They do not need a large lip thickness to withstand impact. This, too, increases the ability of a tool to impart a fine finish to a workpiece.

If you would like to know more about how HAYNES STELLITE tools can be used to speed up machining operations, write or phone our nearest District Office. Our engineers have, at their disposal, the experience of 35 years in the high-speed machining of steel, iron, and non-ferrous materials. They will be glad to help you.

HAYNES TRADE-MARK *alloys*

Haynes Stellite Division
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

"Haynes," "Haynes Stellite" and "Stellite" are trade-marks of Union Carbide and Carbon Corporation.

GREATER MACHINE SPEEDS, LONGER TOOL LIFE, LOWER PRODUCTION COSTS

Lusol THE NEW COOLANT

THAT HAS REVOLUTIONIZED PRODUCTION THINKING

10 MILLION GALLONS OF PROOF

The use of 10 million gallons of Lusol solution in exhaustive testing and in everyday plant applications lies behind the extraordinary claims we make for this extraordinary coolant. It has revolutionized the ideas of some of the country's most critical production experts on the subjects of machine speeds, tool life and production costs. These men demanded proof and got it.

SPEEDS INCREASED UP TO 400%

Lusol affords such efficient cooling at the point of tool contact that it has made possible up to 300% to 400% greater speeds, and at the same time less tool wear, less tool breakage, finer finish and greatly increased production. One case, for example, a bar of 18.8 stainless steel was being cut in 20 minutes. Lusol was then used. Speeds were increased from 30 RPM to 267 RPM and the bar was cut in 2 minutes. On this job tools had been breaking frequently. After shifting to Lusol, tool breakage has been reduced to zero. This is just one case, but it is typical of the results that make Lusol hard to compete with.

WHY OPERATORS LIKE LUSOL

Lusol offers the operator many advantages. In the first place it is clear and clean, mild as a soap solution, and not irritating to the skin. Clothes and shoes are kept cleaner and the whole shop takes on a new look. It helps keeps the machine clean, and a good operator appreciates this; and, very important, it is a clear solution that allows the operator to see the work as the finest drill comes down to the work piece. This means more perfect vision at the critical point so often blurred by old type coolants. On top of being pleasanter and easier to work with, Lusol means fewer tool changes, less wheel dressing, far greater speeds, and more efficient production.

SAVINGS YOU CAN'T AFFORD TO MISS

If you are machining, milling, boring, broaching, tapping, drilling or grinding, you cannot afford to disregard the savings that Lusol has made possible for others (perhaps your competitors) whose production involves these operations. Look at these figures "275% greater production per broach grind," "Saved 90% drills, 75% taps," "Over 200% more pieces per wheel dressing." These are facts. They are proof of the type of result Lusol is achieving and can achieve for you.

PROOF THROUGH CASE HISTORIES

BROACHING

266% greater production per broach grind

AMERICAN HORIZONTAL BROACH

Metal: Steel forging.

Operation: Broach clutch hub. Broach and work ran hot requiring a *shutdown every 2 hours* for cooling when ordinary cutting oil was used. Changed to Lusol and ran 8 hrs. continuously. Tool and work remained cool.

Ordinary Cutting Oil — 2100 pieces per broach grind.

Lusol — 7700 pieces per broach grind.

TAPPING

Tap life increased 1300%

LEES SPECIAL TAPPER

Metal: No. 1008 Steel.

Operation: Tap ¾" — No. 11 1" through an 11/16" drawn hole at 120 SFPM.

Ordinary Cutting Oil: 30 pieces per tap.

Lusol: 420 pieces per tap.

GRINDING OPERATIONS

Grinding time reduced 25%

LANDIS EXTERNAL GRINDER

Metal: CN Steel.

Operation: Step roll grind to 4 diameters; 1-6" r, 1-9" r, 2 rt. angles removing .015"-.030" of metal.

Ordinary Soluble Oil: Grinding time 8 hours.

Lusol: Grinding time 6 hours.

CASE HISTORIES YOU CAN'T AFFORD TO OVERLOOK

Lusol

AVES TOOLS ▼ SPEEDS WORK
CUTS COST

ATIONAL DISTRIBUTION . . . WAREHOUSE STOCKS

F. E. ANDERSON OIL COMPANY
224 Brownstone Ave., Portland, Conn.

Please send me your case history material on:
☐ Broaching ☐ Drilling, Tapping ☐ Grinding

Name

Company

Address

Positively

LIKE MONEY IN THE BANK

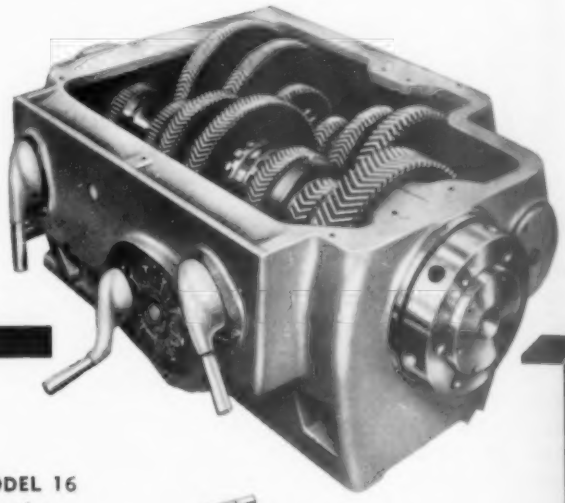
INCREASED PRODUCTION with LOWEST COST PER PIECE

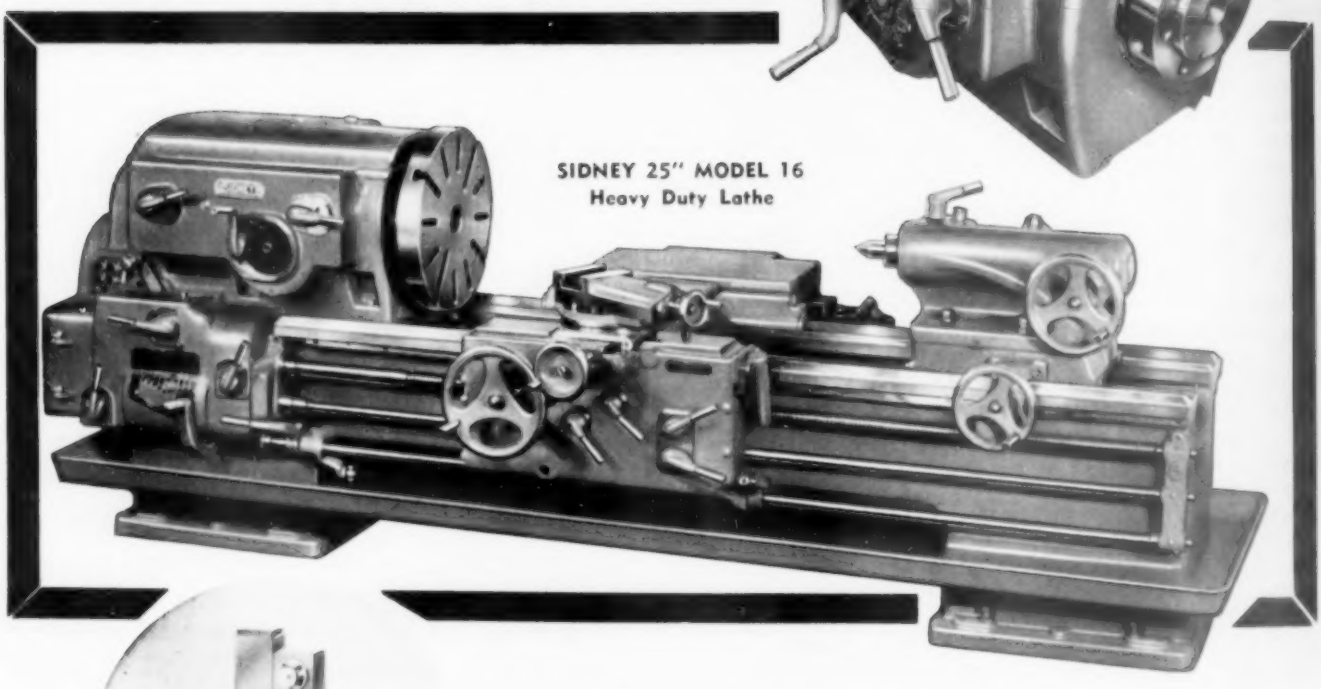
SIDNEY HEAVY DUTY LATHES

Assure accurate, economical, speedy production with minimum maintenance attention . . . automatic lubrication is provided to headstock, gear box, apron, carriage bed ways and cross slide. All mechanisms are completely enclosed giving rigid, compact design and top quality product.

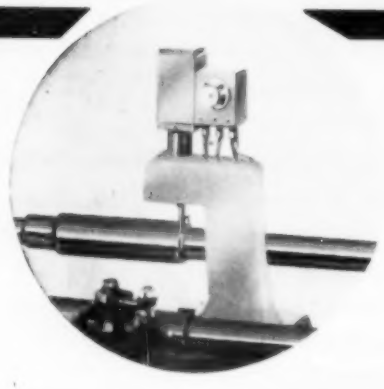
Maximum Tooth Contact for Greater Strength and Smoother Action

SIDNEY HERRINGBONE GEARED DIAL-CONTROLLED HEADSTOCK





SIDNEY 25" MODEL 16
Heavy Duty Lathe



SIDNEY FLUID TRACER

The all-hydraulic control for reproduction of work pieces from flat or round template or regular lathe work without limiting range. It eliminates single purpose tools . . . saves on original investment. No parts to replace or remove for change-over to standard lathe operations.

A complete line of **LATHES**

Precision Tool Room Lathes . . . Production Lathes . . . Gap Lathes . . . Engine Lathes . . . Special Equipment . . . Heavy Duty Coil Winding Machines

Write for details or contact nearest Sidney representative.

SIDNEY MACHINE TOOL COMPANY

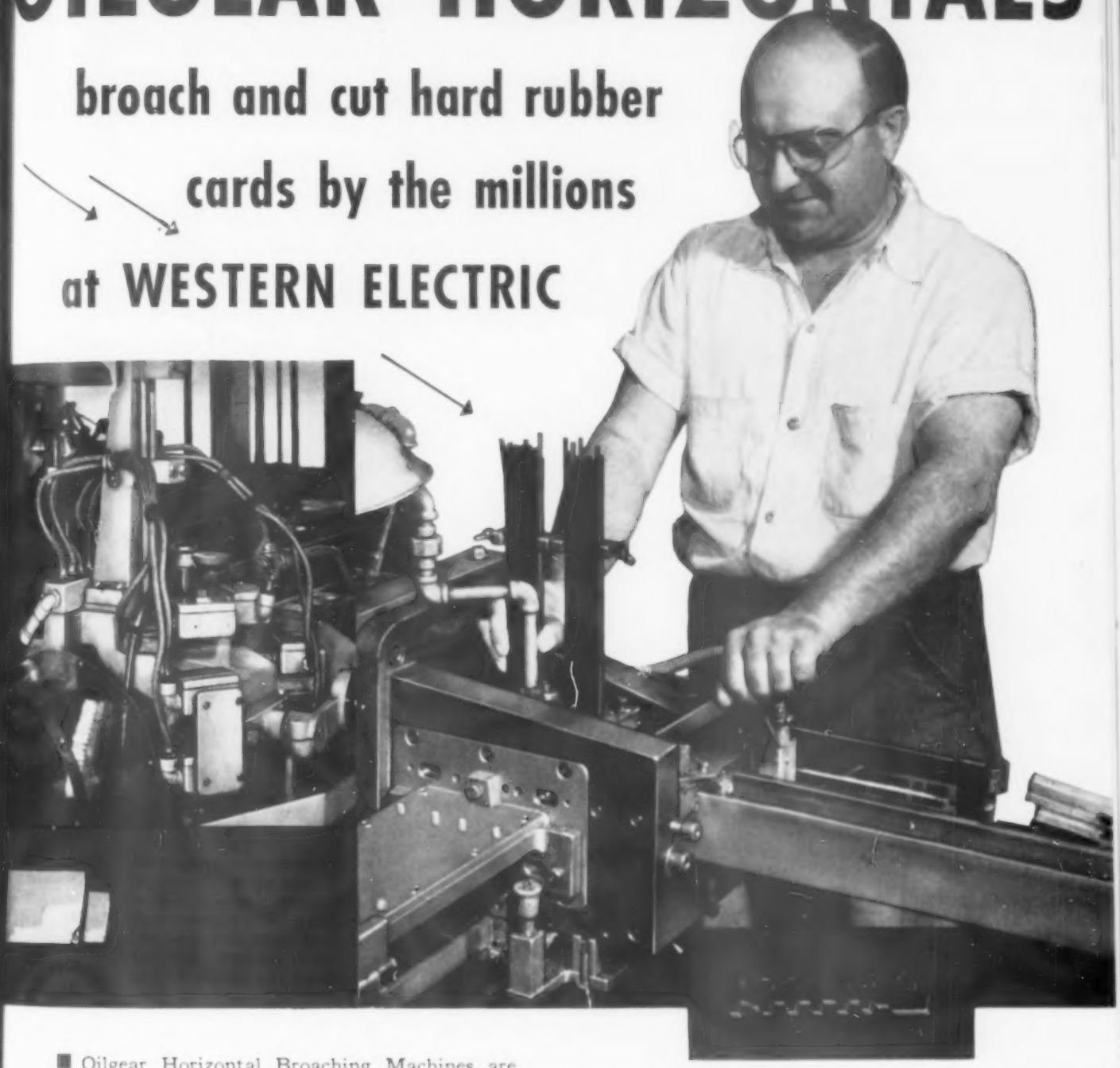
SIDNEY, OHIO

BUILDERS OF PRECISION MACHINERY SINCE

1904

OILGEAR HORIZONTALS

broach and cut hard rubber cards by the millions at WESTERN ELECTRIC



■ Oilgear Horizontal Broaching Machines are used by Western Electric in the broaching and cutting of separators or operating "cards" from hard rubber stock. Used by the millions annually in dial telephone exchanges, these cards must meet precision contour requirements.

A battery of four Oilgear XL-6 x 48" stroke horizontal broaching machines is used to form-broach and cut these hard rubber cards. Each Oilgear Horizontal broaches and cuts 50 cards in a single pass from bundles of strips (1/16" x 1/4" x 23 1/8") that are ground on each side to accurate dimensions. Each machine has a capacity of 12 to 13 million cards per year. These Oilgear Horizontals have been in service a number of years. Elsewhere, Oilgear Horizontals are used to broach and shape similar parts from phenolic stock.

Oilgear Horizontal Broaching Machines indeed have great versatility, can be adapted to many uses, afford great productive capacity. These machines have as standard equipment many features available on no other machines or available only at extra cost. The same performance and dependability that interest careful and rigorous buyers in many industries should interest you. Write for Bulletin 20000B on the Oilgear Horizontals. Also other bulletins on the Verticals. THE OILGEAR COMPANY, 1573 W. Pierce St., Milwaukee 4, Wisconsin.

OILGEAR

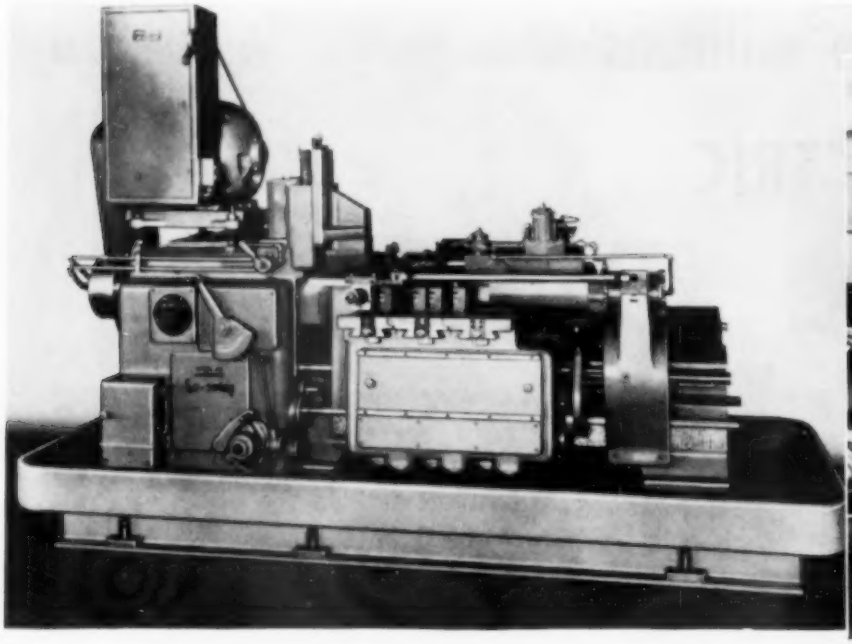
Oilgear

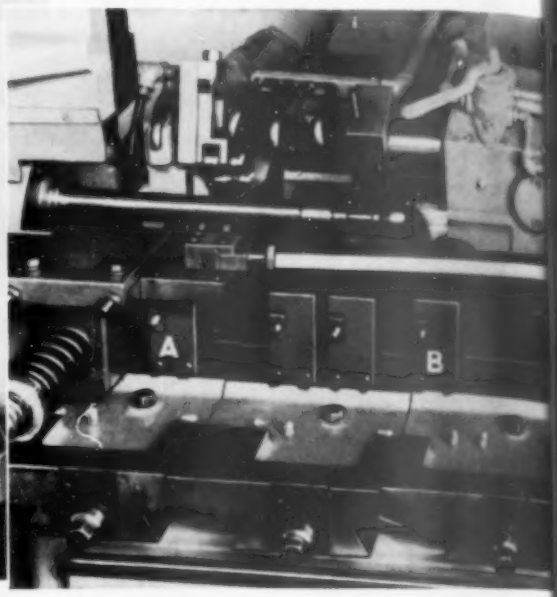
PIONEERS IN FLUID POWER

BROACHING MACHINES AND PRESSES

MACHINE OF THE MONTH

REPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YO





MODEL "AR" Lo-swing SLASHES COSTS ON MAIN DRIVE SHAFT

Problem: To offset high labor costs by increased production on Main Drive Shaft.

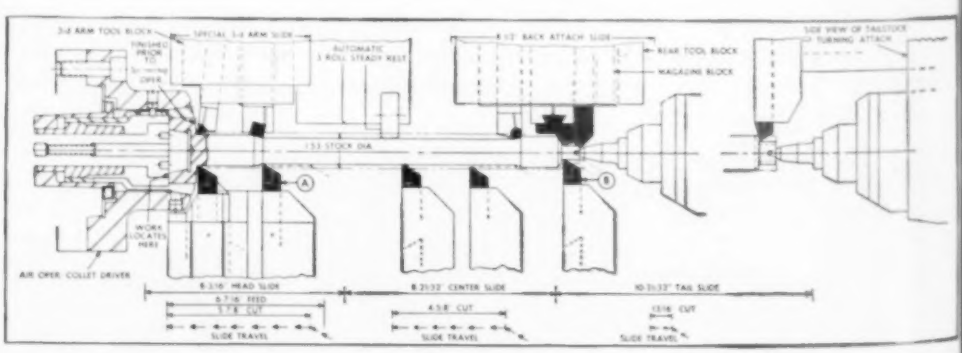
Solution: The Model "AR" Automatic Lo-swing Lathe was selected for this job because it had sufficient weight and rigidity to insure long tool life at high cutting speeds with sintered carbide tools.

Shafts are delivered to the Lathe with the gear end finished to size and the small end centered. The line drawing shows a cross section of the collet chuck which centers and drives the shaft on the gear end. This method of driving increased the rigidity of the shaft. The three-roll steady rest is automatically operated, the rolls being advanced to contact the shaft as soon as tool "A" turns a spotting wide enough to clear the rolls. Tool "A" is the only tool cutting until the steady rest rolls support the piece, after which all the other tools start cutting simultaneously.

Another feature on this machine is the Automatic Tailstock Turning Attachment, shown in the close-up illustration, which is used to rough turn the small end of the shaft ahead of tool "B" which finish turns. This small diameter is held within close limits by this method and a green grind operation is eliminated.

The complete cycle is automatic; the operator simply loads and unloads the parts and pushes the starting button. All tools are carbide. Material is SAE 5140 steel forging and the machine cycle time is 30 seconds.

If you want lower production costs, let us help you with your turning problems.



SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

SEND FOR THIS FREE BOOKLET TODAY!

take a new look at your Gear Shaper Cutters!

SEE HOW TO INCREASE GEAR PRODUCTION AND DECREASE TOOL COSTS!

ILLINOIS

TOOL WORKS

Understand the real function of the gear shaper cutters you use—their broad range of application and how their cutting life can be extended. Check the advantages of cutter design modifications in meeting special gear requirements. See how specific engineering of gear shaper cutters can be important in your cost picture!

For longer life, in mass production or job lots, specify ILLINOIS engineered Gear Shaper Cutters!

Illinois Tool Works, 2501 No. Keeler Avenue, Chicago 39, Ill.

"HEADQUARTERS FOR ENGINEERED CUTTING TOOLS"

TO INSURE PROMPT DELIVERIES . . .

"STANDARD" RECOMMENDS *STANDARDS*

You can depend on prompt deliveries of UNBRAKO Products when you use *standard sizes.*

For, despite shortages, stepped-up demand and other problems of the emergency, we've been able to keep full stocks of UNBRAKO "*standards*" on our dealers' shelves—ready for immediate delivery.

And that's not all . . . Every time you use a *standard size* UNBRAKO it represents a substantial saving over the cost of a "special."

Be sure you have our latest catalog of UNBRAKO *standard* products. Send for your copy of Bulletin 643-R *today.*

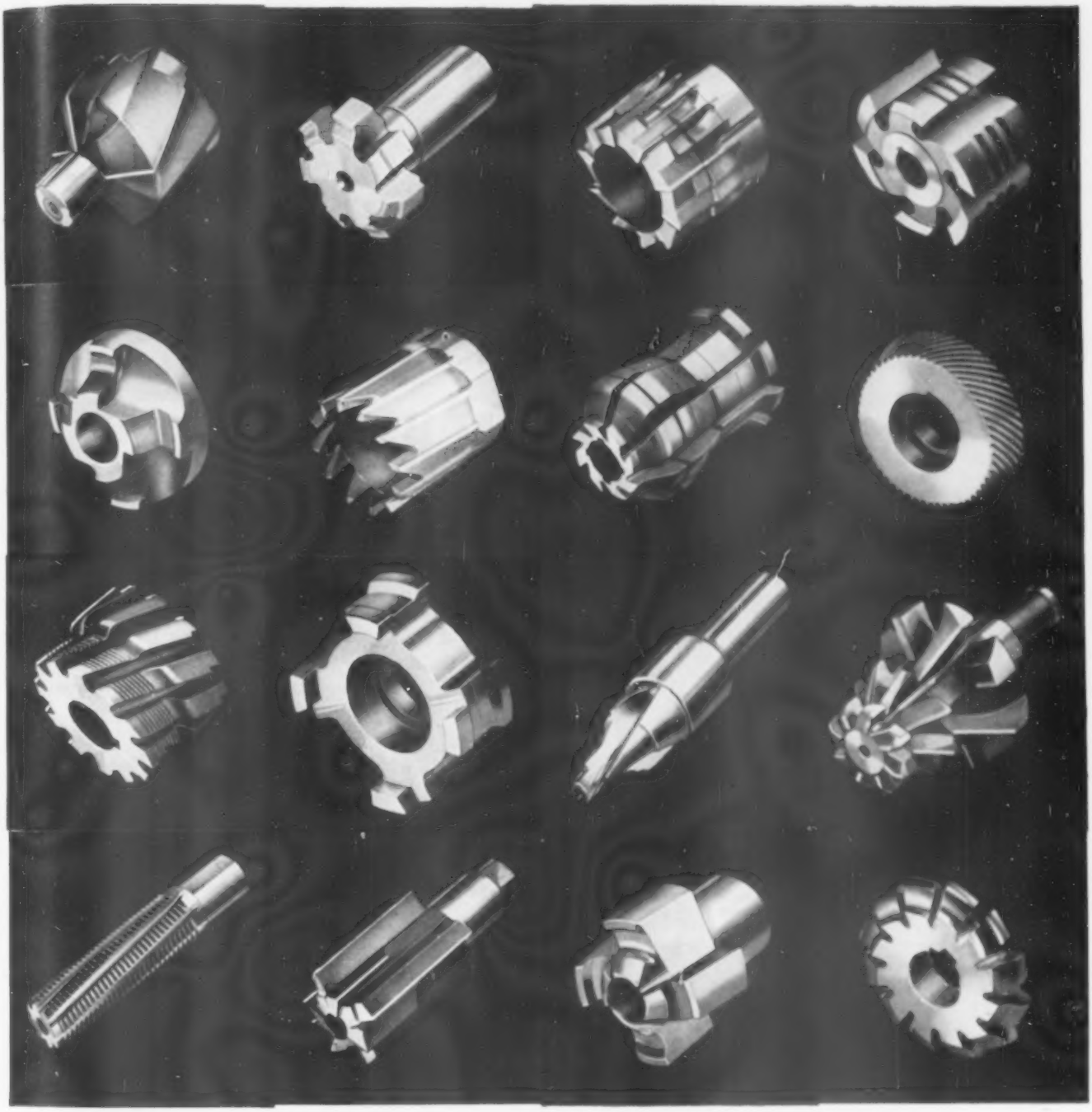
Knurled Head Socket Cap Screws
Flat Head Socket Cap Screws
Self-Locking Socket Set Screws

SOCKET UNBRAKO SCREWS

Knurled Head Shoulder Screws
Precision-Ground Dowel Pins
Fully-Formed Pressure Plugs

SPS STANDARD PRESSED STEEL CO.

JENKINTOWN 37, PENNSYLVANIA



Checkmate RISING COSTS!

...WITH SPECIAL CUTTING TOOLS FROM

NATIONAL TOOL CO.

CLEVELAND 2, OHIO

REPRESENTATIVES IN MAJOR INDUSTRIAL CENTERS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-99

How to reduce costs in milling, drilling, grinding

by using **VERSA-MIL** to do

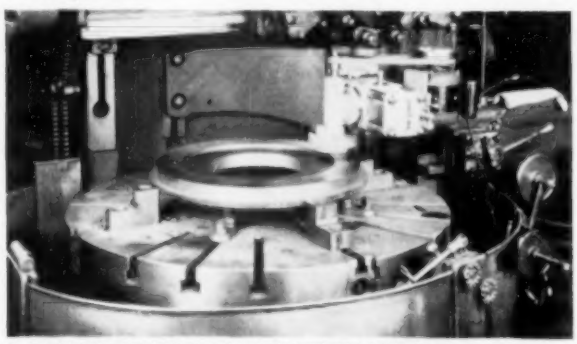
MORE JOBS ON ONE MACHINE

Size 2 Basic Unit

6" travel on posts; #2 Morse taper; 9" x 6½" base; Weight: 89 lb. with ½ hp. AC motor; 104 lb. with ¾ hp. AC motor.

1. CUTTING KEYWAYS 48" APART: Lathe plus Versa-Mil permits easier, more economical milling of difficult pieces. Here, a series of widely separated cuts, accurately aligned and to precise depth are obtained without resetting work piece.

2. LARGE CASTINGS DRILLED FOR 1/2" HOLES: Here Versa-Mil saves handling and crane time by finishing a heavy casting in one set-up on planer. Across-the-bed cuts can also be made while work piece is still in position.



3. SURFACE GRINDING ON VERTICAL TURRET LATHE: By combining Versa-Mil with large single-cutter tools such as planers and vertical boring mills, large pieces beyond the capacity of most shops may be ground.

Here's a cost-cutting tool that permits you to do a wide variety of jobs on almost any machine tool you have—engine, toolroom or turret lathe, vertical or horizontal boring mill, or planer. With these *and Versa-Mil*, you can mill slots, faces, gears . . . you can drill, bore, ream . . . you can grind cylindrical and flat surfaces. All on the *single* machine. All with *precision*. All with money-saving *speed*.

By doing several, and often *all* of the required operations with a single set-up, you cut preparation and handling time. You free other machines for other production.

TAKE THIS TOOL TO TOUGH MAINTENANCE JOBS

You can adapt Versa-Mil to take into the plant or field to do repair-machining on the spot. You save dismantling and transportation. Downtime is reduced to a minimum. Obviously, the heavier, the more cumbersome the equipment that requires the machining, the more you save with Versa-Mil.

Like the many well known companies now using one or more, you, too, will find Versa-Mil opens up new opportunities for reducing costs in precision machining. Write for new bulletin just off the press.

VERSA-MIL COMPANY
30 Church Street, New York 7, N. Y.

COMPANIES LIKE THESE ENDORSE VERSA-MIL!

Among the ever-growing number of plants that are now lowering machining costs with Versa-Mil are such concerns as:

Armstrong Cork Co.
Baldwin Locomotive Works
General Electric Co.
International Harvester Co.
New York Central Railroad
Otis Elevator Co.
Phelps Dodge Copper Products Corp.
Sinclair Refining Co.
Standard Oil Co. of New Jersey
Todd Shipyards
U. S. Gypsum Co.
Westinghouse Electric Corp.

Many of these companies and also others have re-ordered additional units again and again!

VERSA-MIL

TRADE MARK

The Tool for Precision Milling, Drilling, Grinding

25% MORE HOLES PER GRIND!

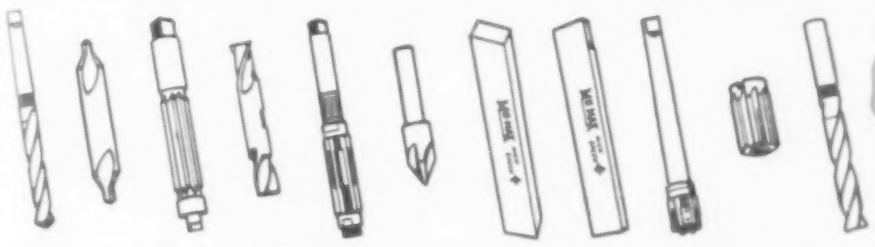
This CLE-FORGE High Speed Drill solved a tough problem!

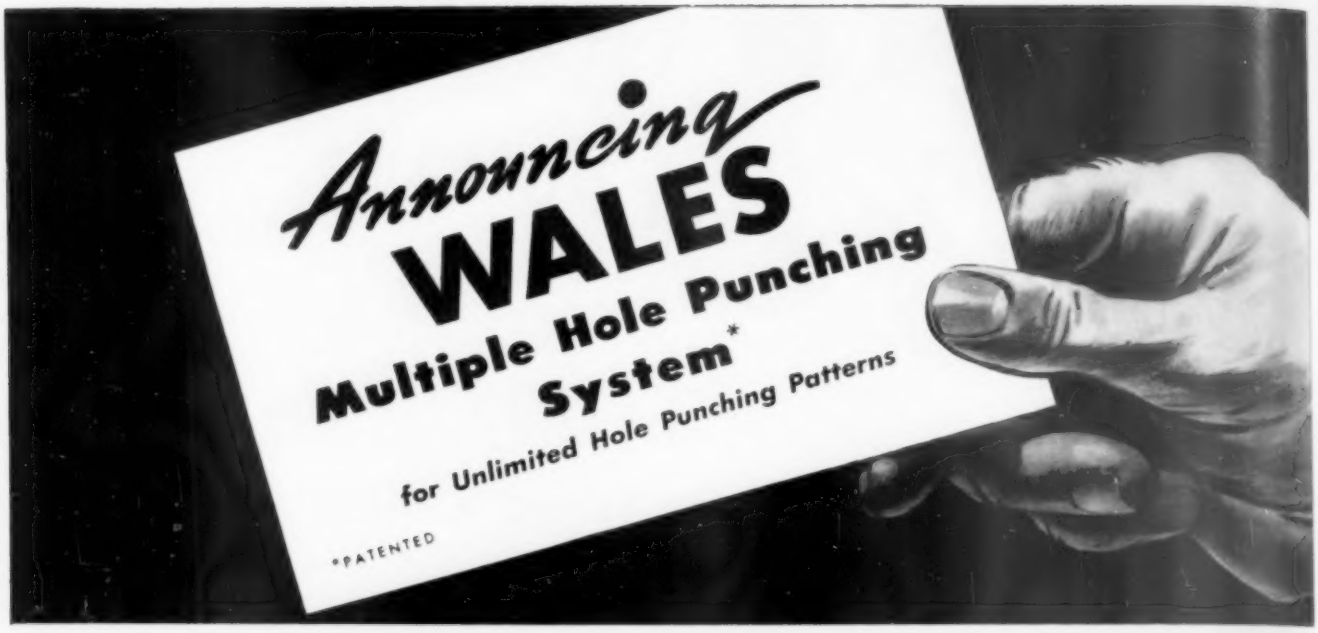
This job was really rough. Each of the eight drills had to make two holes, and each surface was at an angle. The drills were averaging 1470 holes per grind, with considerable breakage. ◈ A *Cleveland* Service Representative was called in to analyze the problem. He recommended switching to the CLE-FORGE High Speed Drill shown at the left—a regular stock drill that has a heavier web. After an exhaustive test it was found that CLE-FORGE High Speed Drills averaged 1838 holes per grind! Breakage was practically eliminated! ◈ Let a *Cleveland* Service Representative show how *you* can get MORE HOLES PER DOLLAR. Contact our nearest Stockroom, or . . .

Telephone Your Industrial Supply Distributor

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS





● This new System does more than just perform the operation of punching holes another way, it does it *faster* and *cheaper* by putting accurate hole punching dies in operation in a matter of minutes.

Set-ups are made outside the press, placed in the press and hole punching starts with the first stroke of the ram—press "downtime" is reduced to a few seconds. Wales Punch and Die Units are standardized for unlimited interchangeability which permits continuous use and re-use in infinite set-ups. Wales Box-Type set-ups are self-contained . . . no die setting skill . . . no adjusting . . . no aligning is required before or after placing in the press.

By using master templets, holes are accurately located and drilled. Store drilled Twin Plates and Boxes and you store the pattern without the Units.

All individual parts of this Wales Multiple Hole Punching System are available for you to drill and assemble set-ups OR the Wales-Strippit Corporation will deliver complete set-ups ready to operate.

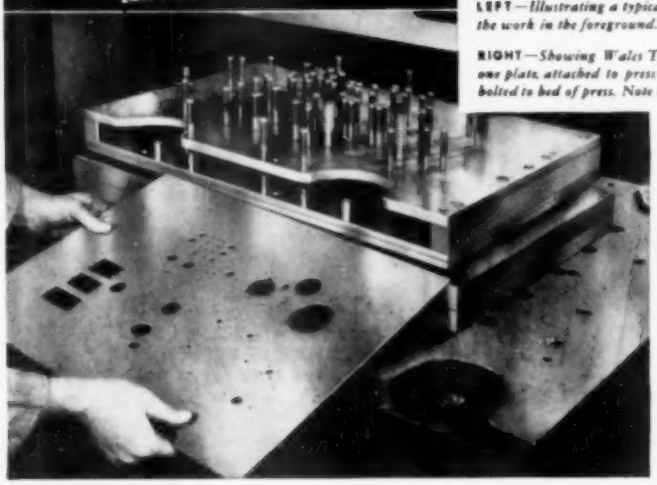
WALES-STRIPPIT CORPORATION
GEORGE F. WALES, *Chairman*
393 PAYNE AVE., N. TONAWANDA, N. Y.
(Between Buffalo and Niagara Falls)
WALES-STRIPPIT OF CANADA, LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

SEND FOR THIS FULLY-ILLUSTRATED BROCHURE TODAY. The Story of this latest addition to America's most complete line of hole punching and notching equipment is too big to tell on this page so write for Brochure M *today*.

LEFT—*Illustrating a typical Wales Box-type set-up with the work in the foreground.*

RIGHT—*Showing Wales Twin Plates with Punches in one plate, attached to press ram and dies in other plate bolted to bed of press. Note the work in foreground.*



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We wonder if he has ever found
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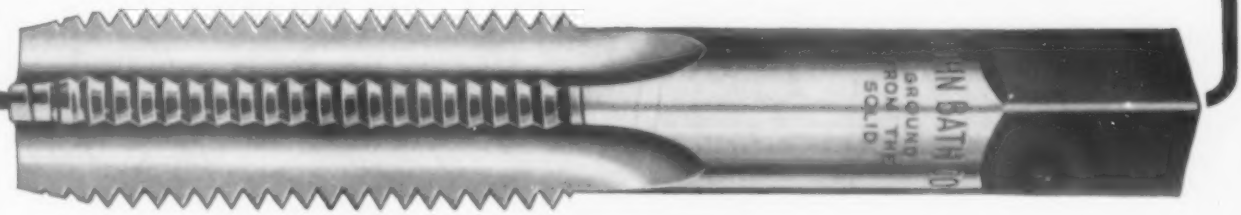

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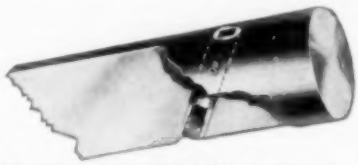

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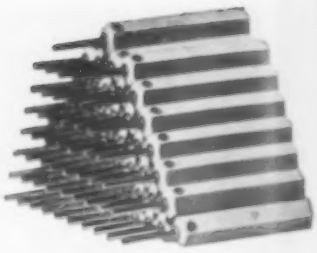

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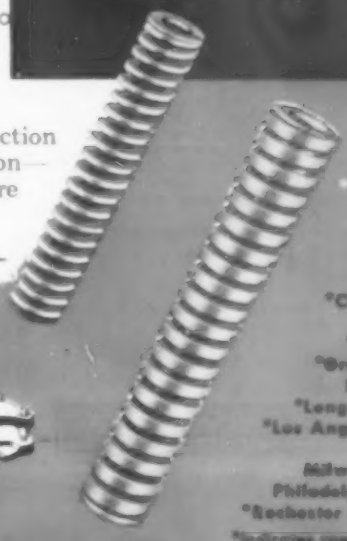

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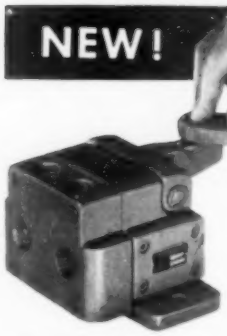

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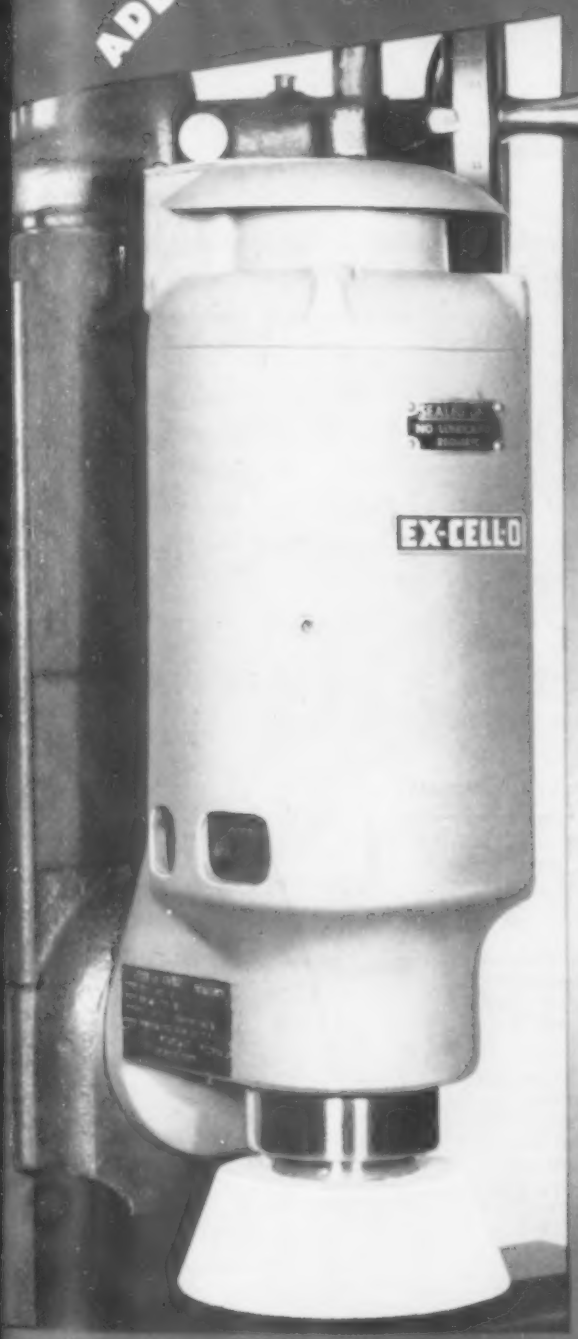

Ex-Cell-O 1 horsepower, 3600 rpm inbuilt motor spindle for surface grinder. Spindle swivels vertically, is used for sharpening cutters and broaches.

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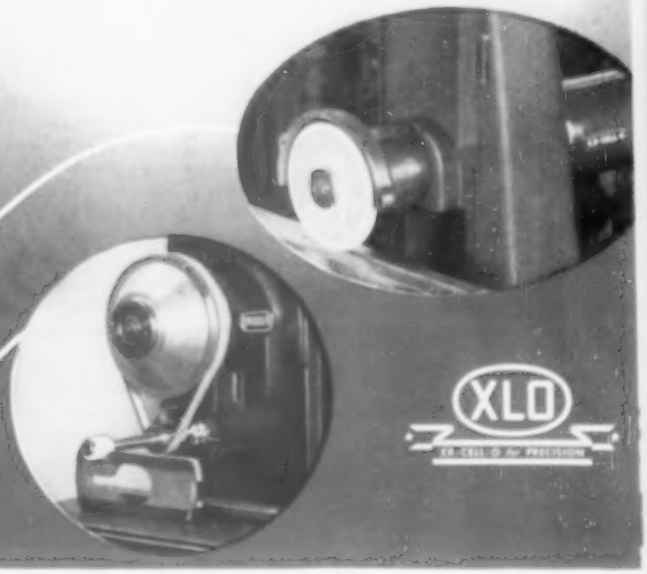

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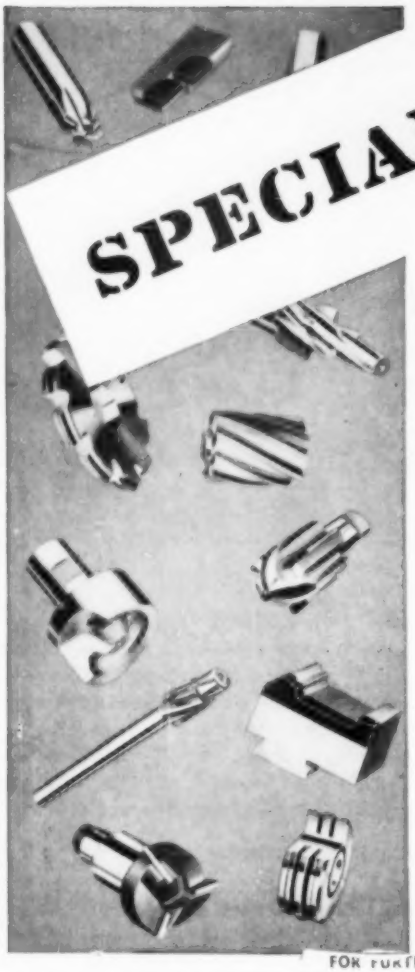

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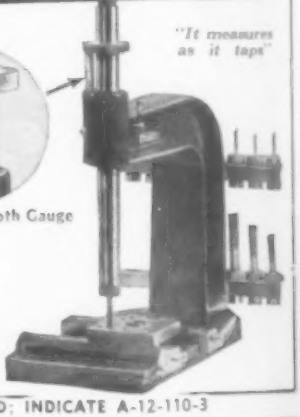

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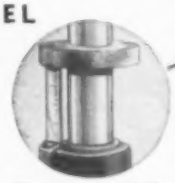

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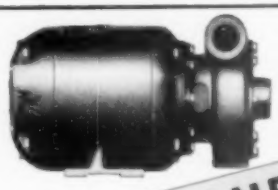

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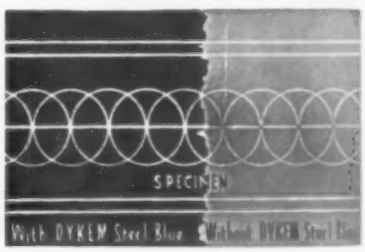

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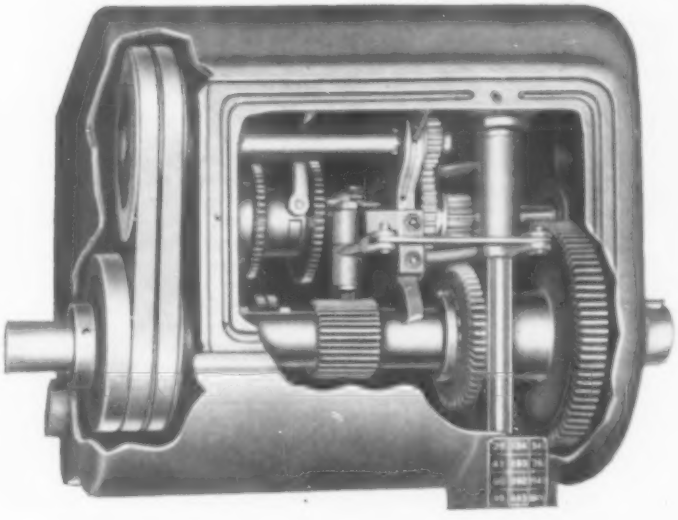
THIS LATHE USES ITS HEAD

to give you full power at all twelve speeds from 28 to 1800 r.p.m.



LeBLOND DUAL-DRIVE

Dual-Drive headstock design combines belt and gear drive to give you the widest range of speeds in the medium-price class—all at full horsepower.

Result? Smooth *full* power at high speeds—ideal for carbide and fine-finish turning. Rugged *full* power at low and intermediate speeds—for fast, efficient rough turning. Add convenient, single-lever speed control and the widest feed range in its class—and you have a lathe that does more jobs, faster, better, easier than any comparable machine.

Sixty-three years of machine tool leadership stand behind LeBlond's complete line of 76 lathe models to give you day-in, day-out dependability. Your nearby LeBlond Distributor will tell you about the Dual-Drive and other late models. Call him or write—

THE R. K. LeBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Sales offices in New York, Chicago, Detroit.

15

DUAL-DRIVE FEATURES

15" swing

Combination belt and gear drive

Twelve speeds from 28 to 1800 r.p.m.

Ninety-six feeds from .0004" to .106"

Forty-eight threads from 4 to 224

Single-lever speed control

Totally-enclosed feed box

Electric brake, forward and reverse spindle control at apron

Single-lever positive jaw feed control

Automatic lubrication through headstock and feed box

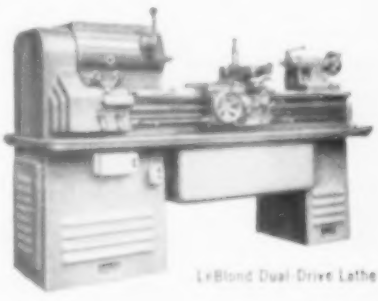
Hardened steel gears and anti-friction bearings

Multiple automatic length stops

One-piece apron

Hardened and ground replaceable steel bed ways

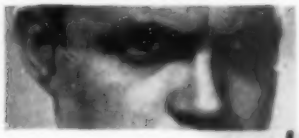
Taper key drive spindle nose



LeBlond Dual-Drive Lathe

LeBLOND Dual Drive

World's largest builder of a complete line of lathes.



STOP "GUESS-GAGING"!

USE

FEDERAL INDICATING GAGES AT PRODUCTION

If your machine operators wear that "guess-gaging" look, it's time to take a new look at your dimensional control gages. Old-type gages don't give your men a fair break. Ordinary snap gages, for instance, can't possibly warn machine operators when their machines are about to produce scrap. On the other hand, Federal Indicating Gages give your men the complete dimensional control they need to *prevent scrap*.

"GUESS-GAGING"

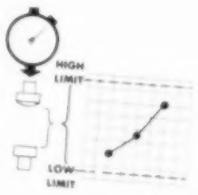
Checking parts coming off the machine with a "go, not-go" gage, the operator has to guess on borderline cases. No indication is given of tool wear, machine adjustment changes, etc.

When the operator finds parts are over or under size, the damage has already been done. He has produced scrap because he was penalized by "guess-gaging" dimensional control equipment.

INDICATING GAGING

Put a Federal Indicating Gage in the hands of this same operator. He doesn't "guess-gage" because he *sees* exactly what each workpiece measures.

Obviously something is happening. The Indicating Gage shows the diameter is becoming larger. The operator makes machine and tool adjustments *now* . . . *before* scrap is produced.



Federal has pioneered in the development, design, and manufacture of Indicating Gages of all types—mechanical, electrical, electronic, and air. If you are modernizing your dimensional control equipment, be sure to consult Federal. No obligation. FEDERAL PRODUCTS CORPORATION, 1912 Eddy Street, Providence 1, R. I.

FEDERAL

Largest manufacturer of indicating type gages . . . exclusively.

USE READER SERVICE CARD: INDICATE A-12-114-1

Precision WORK LIKE THIS!

Valve Stem for Fuel Injection System, Jet Propulsion Engine. MATERIAL: Stainless Steel

Ball and Race Unit for Radar Instrument. Lapped to No. 1 Micro Finish. .0001 Accuracy all over. MATERIAL: [illegible]

is BETTER . . .

if it's made by FULLER!

Holding precision limits to one ten thousandth of an inch is everyday procedure with Fuller skilled craftsmen. Under the supervision of the six Fuller brothers, some really phenomenal results in accuracy have been achieved. If you have a precision part or tool that demands out-of-the-ordinary machining skill to produce . . . you can completely rely on Fuller craftsmanship to follow your most exacting specifications. It's a matter of family pride.

"BETTER" if it's made by FULLER!

SKILLED CRAFTSMEN

FULLER TOOL Co.

SPECIAL TOOLS • PRECISION MACHINING

GUILD

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Modernair SQUARE CIRCLE CYLINDER

FOR AIR AND OIL APPLICATION

MODERNAIR SQUARE CIRCLE cylinders may be mounted flush in multiple applications —in a fraction of the space required for round body cylinders.

- **Minimum space required for flush mounting**
- **Large port design—no inside restrictions**
- **Piston rod and tie rods are extra heavy duty**
- **Chevron gland packings are self-adjusting**
- **Heavy duty mounting brackets are interchangeable**
- **Oilite bearings insure uninterrupted long service!**

WRITE FOR CATALOG TO:

Modernair CORPORATION
SAN LEANDRO, CALIF

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How to make the Invested Dollar Pay More . . . . .

Increased Shop Efficiency through Replacement of Economically tired machines.

Initiative in applying machines to the job.

Development of short cuts and tooling arranged to improve time savings since increased machine efficiency as well as shop efficiency pay more on the Invested Dollar.

Investment in machines of complete flexibility having the potential facilities to adapt themselves to present and future changes of tooling and machining methods———

> Bullard Cut Master meets these conditions and one customer states: "You can do more with a Bullard than you can with———."
>
> In this same customer's plant, a Bullard installation is showing a nice 40% savings over the previous method.

This is only one of many instances where Cut Master lives up to its name.

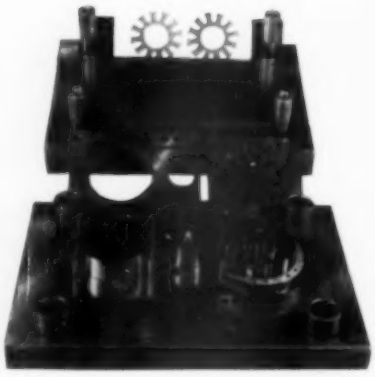
These machines provide maximum shop efficiency and answer the question, "How to make the Invested Dollar Pay More?"

On request we will be pleased to furnish you with a copy of Mapi Replacement Manual.

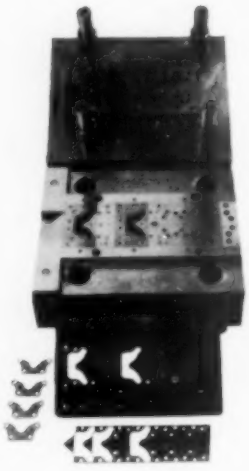
If you have hidden costs which are paying for a Cut Master, why not investigate and then have a Cut Master in 30", 36", 42", 54", 64", or 74" size.

THE
BULLARD
COMPANY
BRIDGEPORT 2,
CONNECTICUT

LAMINATION DIES BY COMMANDO



Built of hi-carbon, hi-chrome



Built of tungsten-carbide

Built of hi-carbon, hi-chrome

Lamination dies by Commando are giving outstanding performances daily throughout the country. Names of our many satisfied customers will be furnished upon request. If you have a lamination die problem, our precision, segmented, all ground dies should be your answer.

Write, wire, or 'phone today.

• Lamination Die Specialists • Hi-Carbon • Hi-Chrome • Vasco-Supreme • Tungsten-Carbide

COMMANDO TOOL CO., INC.

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Detroit 20, Mich.
Phone: JOrdan 4-6743

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GUSHER
MACHINE TOOL
COOLANT PUMPS

The Right Way
to Higher Profits
FOR YOU!

You're protecting your production and profits when you use Ruthman Gusher Coolant Pumps on your metal-cutting machinery. Ruthman Gusher Pumps offer you an advanced design that assures you superior performance under the demands of stepped up production. And you know when it's a Ruthman Pump, it's built to last.

Write us today. There's a Gusher type and model to fit your coolant problem.

THE RUTHMAN MACHINERY CO.

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For

- LATHES
- GRINDERS
- SPINNING
- MILLING
- GEAR PRODUCTION

Ball Bearing—High Speed—Tungsten Carbide
IN STOCK or to SPECIFICATIONS

CENTER Specialists Since 1900

RED-E-TOOLS **THE READY TOOL CO.**

558 Iranistan, Bridgeport, Conn.

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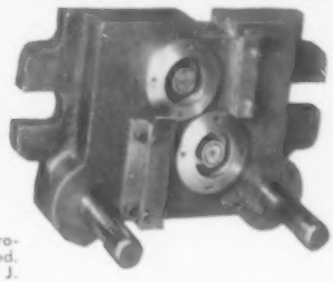
TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 65.

No Postage Needed

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

In the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



Made from BTR oil-hardening tool steel, this die recently produced 7,953,632 bottle caps before redressing was needed. Photo courtesy of R. M. Hollingshead Co., Camden, N. J.

BTR BLANKS AND FORMS 100,000 BOTTLE CAPS IN EIGHT HOURS

High-Production Die Still Going Strong After Four Years' Service

Takes a long time to wear out a die that's made from BTR. This popular, oil-hardening grade was selected by the R. M. Hollingshead Co., Camden, N. J., for this high-production die that blanks and forms 1-in. bottle caps from tin plate in almost fabulous quantities. Hardened to Rockwell C-61, the die is redressed about every three months. Records kept by William Schaefer, machine shop foreman, show that the die recently produced 7,953,632 caps between grinds. Such results indicate good tool design, correct heat-treatment and grinding . . . and quality tool steel to fit the job.

The performance record of this die over a four-year period is a good example of the long wear of which BTR is capable. Next to carbon tool steel, BTR is the most versatile of Bethlehem fine tool steels. It's safe-hardening in oil at 1475 F. It holds close dimensions during heat-treatment, has high resistance to wear and shock. BTR is an economical grade to buy, and it's easy to machine and heat-treat. There's not much more you could ask of a general-purpose tool steel!

Our Tool Steel Engineer Says:

Reduce tool failures by removing "feather" edges

A "feather" often remains on the working edges of tools after they are ground. Especially on cutting tools, it is best to remove these irregularities. Otherwise the cutting edge will get dull or fail prematurely. The experienced shop man carries a stone in his pocket for touching up such edges, for he knows that removing feather edges pays off in longer tool life.

This die of Lehigh S puts large dents in 3-in. steel tubing which is then fitted with baffles to make an efficient flue for space heaters.

Lehigh S Solves Problem for Space-Heater Manufacturer

In setting up the production of their patented "Heat Trap" flue for gas space heaters, the Day and Night Manufacturing Co., Monrovia, Calif., needed a tool steel with the absolute maximum of wear-resistance. The design called for a series of indents in a steel flue, staggered and baffled so as to retard rising hot gases in the flue and deflect them from side to side.

Lehigh S was the logical choice. This high-carbon, high-chromium grade (2.05 pct C; 12 pct Cr) has the highest hardness of all Bethlehem tool and die grades, ranging up to Rockwell C-66. And that's *hard!* Used for the form punches and inserts at wear points for the forming die illustrated, Lehigh S has given long service, requiring no maintenance after putting indents in more than 300,000 pieces of 3-in. steel tubing.

Heavy-Duty Shear Blades Made to Your Order

When you buy Bethlehem Shear Blades you get the benefit of our many years of experience in making all our own specialty shear blades for cutting sheets, strip, billets, bars, and plates in our own plants. Making our own shear blades involved many years of special development work in tool steels, and in blade design, heat-treatment, and grinding techniques. But we developed this product because we needed better blades than we were able to purchase, blades better able to stand up under heavy shock and high wear.

Bethlehem Shear Blades are usually made from Lehigh H, Lehigh L (for better shock resistance), or Lehigh S (for greatest wear-resistance where heavy shock is not a factor). Some are made from our hot-work and shock-resisting tool steels.

Among our specialty blades are: flying pinch knives for continuous sheet-strip mills, resquaring shear knives, heavy-duty knives for plates, rotary slitters, and many special-purpose blades.

Bethlehem blades have established fine performance records in the most severe types of shearing service. If you use blades requiring high-alloy tool steels let us tell you what we can do for you in supplying shear blades specially designed to your requirements.

Rotary slitters and shear blade made of Lehigh H, our most popular grade of high-carbon, high-chromium tool steel—for maximum production.

Bethlehem ULTRASONIC TESTED **Tool Steel**

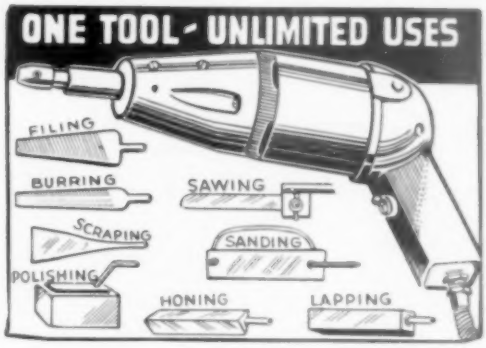
DEPENDABLE ACCURACY

INSPECTION TOOLS made of MEEHANITE METAL are designed to fill your various Inspection and Checking needs. Sturdily constructed to give you reliable, accurate service.

Surface Plates
Box Parallels
Slotted Angle Plates
Universal Right Angles
Flat Parallels
Lapping Plates
Toolmakers' Knees
Straight Edges
Masterangle Plates
Angle Attachments

Surface Plates Rescraped Like New

CUT PRODUCTION TIME!



Use these Handy PORTABLE, ELECTRIC RECIPROCATING TOOLS for Greater Production, Better, More Uniform Work—All with less Operator Fatigue. Fixed strokes are $\frac{1}{8}$" or $\frac{3}{8}$" long. Operate on 110 Volts AC-DC. Deliver 1000 PUSH-PULL strokes per minute. Try one of these tools on your next job.

PRECISION PRODUCTION TOOLS

ACME TOOL COMPANY

75 West Broadway New York 7, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-12-118-1

TODAY'S FIRST NEED!

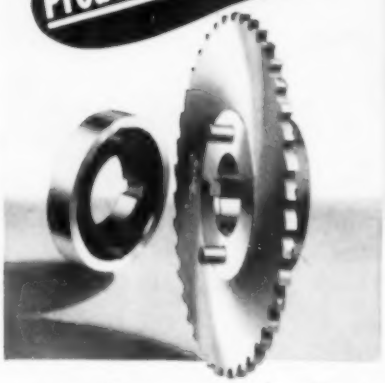
PRODUCTION - but Production with Accuracy!

GET BOTH

with Motch & Merryweather

Triple-Chip METHOD

SLITTING and SLOTTING SAW BLADES



Every wanted advantage in modern slitting and slotting, PLUS M. & M.'s exclusive dual drive. Only Motch & Merryweather slitting and slotting blades bring you 4 great features: (1) Triple-Chip efficiency; (2) dual drive adaptation; (3) blade interchangeability (fewer blades required); (4) special sizes.

Stock sizes carried by your local dealer.

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING · CLEVELAND 13, OHIO
AT YOUR COMMAND · AN UNPARALLELED EXPERIENCE IN CIRCULAR SAWING

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Time Out FROM A TEDIOUS JOB!

On tapping and reaming jobs, take time out to get a Ziegler Tool Holder and you'll save time in aligning the work with the spindle on every job thereafter. Why? Because the Ziegler Holder compensates for inaccuracies up to 1/32" on the radius or 1/16" on the diameter. Saves time EVERY TIME!

Always floats freely, without friction or cramping, even under the severest tool-driving strains, and takes any and all end-thrusts. Makes it possible to turn out work to the finest of tolerances in spite of faulty alignment of the work with the spindle!

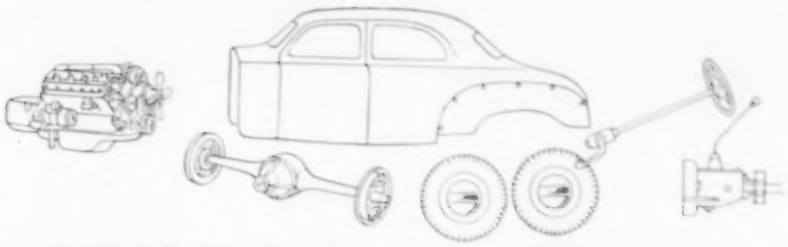
In nation-wide use. Try it out and see how much better tapping and reaming your machines will perform.

W. M. ZIEGLER TOOL COMPANY
13574 Auburn Avenue Detroit 23, Mich.

WRITE FOR CATALOG

Ziegler ROLLER DRIVE **FLOATING HOLDER** for Taps and Reamers...

USE READER SERVICE CARD; INDICATE A-12-118-3



YOU WOULDN'T buy a car this way

...so why buy hydraulics piecemeal

VICKERS Custom Built

HYDRAULIC POWER UNITS

Simplify Hydraulic Design

Reduce Installation and Maintenance Costs

When you buy an automobile you don't make separate purchases of engine, fenders, wheels, frame, axles, gear box, windshield, etc. and try to put them together. You buy a complete car, all in one piece. You don't want the expense and trouble of making the assembly. You do want the undivided responsibility of manufacturer and dealer for the complete car.

Why, then, buy hydraulics piecemeal when you can get a Vickers Custom Built Hydraulic Power Unit? It is built to meet your individual requirements. All necessary pumps, valves, intermediate piping, oil reservoir, motors, controls, etc. are in one self-contained "package." It includes all needed hydraulic accessories such as oil filters, air cleaners, oil level gauges, fittings, etc. Hydraulic connections are grouped in a conveniently located manifold.

The result is simplification of hydraulic design and substantial savings in installation and maintenance costs. Undivided responsibility of Vickers for the entire hydraulic system is an important advantage to both the machine builder and his customer. • *Write for Bulletin 50-61.*

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

4315

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DECEMBER, 1950

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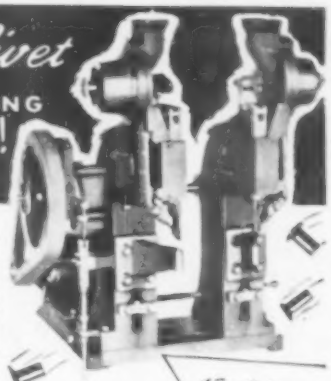
Chicago Rivet

AUTOMATIC SETTING SLASHES UNIT COSTS!



If your product involves a fastening operation—wood to wood, metal to metal, fabric to fabric, composition to composition, or any combination of these—you can slash unit costs by increasing production volume with high speed Chicago Rivet Automatic Setters and Chicago Rivet tubular or split rivets. Four rivets are automatically fed, inserted and upset at one release of the foot pedal by the quadruple mode! Chicago Rivet Setter. Single, double and triple setters are also available.

Bench type Double Rivet Setter with Adjustable Riveting Centers

Quick change hoppers, available as extra equipment, enable some models to switch quickly from one size and style rivet to another. Nearly all models clinch grommets, eyelets, staples and Dzus fasteners and insert drive screws—all automatically.

A Few Applications

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AUTOMOBILE PARTS
BEAUTY PARLOR EQUIPMENT
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BICYCLES
CAMERAS
CAN OPENERS
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CASH REGISTERS
CLOCKS
COFFEE POTS
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ELECTRICAL PARTS
FAN BLADES
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FLASHLIGHTS
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GARAGE DOORS
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KNIVES
LAMPS
LAWN MOWERS
LEATHER GOODS
LOUDSPEAKERS
LUGGAGE
MILK BOTTLE CRATES
MONOTYPE
MOTOR FANS & PARTS
PULLEYS
RADIO PARTS
REFRIGERATORS
RUBBER GOODS
SEWING MACHINES
SHOES & SKATES
STOP LIGHTS
STOVES
TELEPHONES
TOASTERS & TOYS
TYPEWRITERS
VENTILATORS
WASHING MACHINES

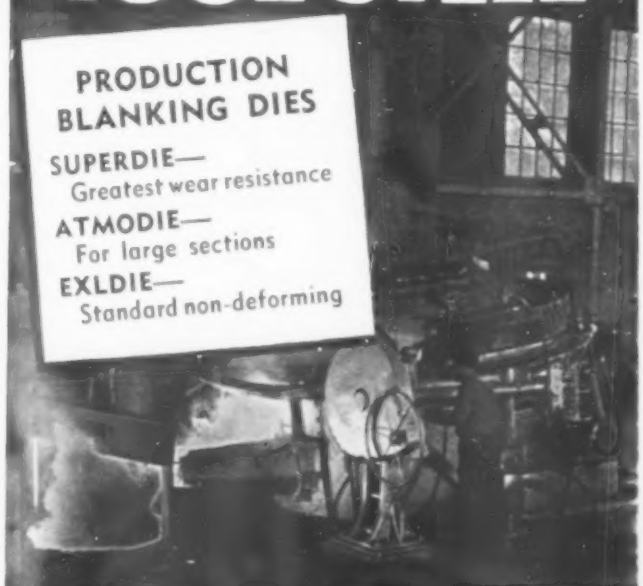
FREE FASTENING CLINIC

If your product is small, send us an unfastened sample. If it's large, send a sub-assembly. We will gladly analyze your fastening problem, recommend the type rivet and Chicago Rivet Automatic Setter needed and estimate production rates that can be set up on the job.

Chicago Rivet CHICAGO RIVET & MACHINE CO.
9619 W. Jackson Blvd., Bellwood, Ill.

USE READER SERVICE CARD; INDICATE A-121-1

Columbia TOOL STEEL



PRODUCTION BLANKING DIES

SUPERDIE—
Greatest wear resistance

ATMODIE—
For large sections

EXLDIE—
Standard non-deforming

COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
520 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

USE READER SERVICE CARD; INDICATE A-12-121-2

3820
4521

54 V C LATHE

A Four Spindle Vertical Continuous Lathe having 5" chucks.

For light turning operations as for truing and finishing cuts.

About 43" x 60" x 76" high.

Turret revolves continuously and the work is automatically gripped, turned and automatically released as the turret passes through its complete cycle.

The work spindle may be automatically positioned to facilitate the loading and unloading of the work as required on some jobs.

Cycle time varies with the job.

ASK BAIRD ABOUT IT

THE BAIRD MACHINE COMPANY STRATFORD, CONN.

Baird also builds High Production Machine Tools, Multiple Spindle Chucking Machines and Grinders, Wire Ribbon Metal Formers, Automatic Presses, Tumbling Barrels

USE READER SERVICE CARD; INDICATE A-12-121-3

"no more GAMBLING on tool steel selection"

[⅓ actual size; Selector is in 3 colors]

Since the first announcement, hundreds of tool steel users have received their CRUCIBLE TOOL STEEL SELECTORS. The comments received indicate that this handy method of *picking the right tool steel right from the start* is going over big.

"Handiest selector I've ever seen"

"No more gambling on tool steel selection"

"You're right, the application should dictate the choice of the tool steel" . . . and many, many more favorable comments.

You'll want your CRUCIBLE TOOL STEEL SELECTOR. It uses the only logical method of tool steel selection—begin with the application to pick the right steel! And the answer you get with one turn of the Selector dial will prove satisfactory in every case, for the CRUCIBLE TOOL STEEL SELECTOR covers 22 tool steels which fit 98% of all Tool Steel applications. ALL the tool steels on the Selector are in Warehouse Stock . . . that means when you get the answer, you can get the steel . . . fast!

Write for your Selector today! We want you to have it, because we know you've never seen anything that approaches your tool steel problems so simply and logically. Just fill out the coupon and mail. Act now! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!!

Crucible Steel Company of America
Dept. T, Chrysler Building
New York 17, N. Y.

Gentlemen:

Sure! I want my CRUCIBLE TOOL STEEL SELECTOR!

Name_____ Title_____

Company_____

Street_____

City_____ State_____

CRUCIBLE first name in special purpose steels

TOOL STEELS

fifty years of Fine steelmaking

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

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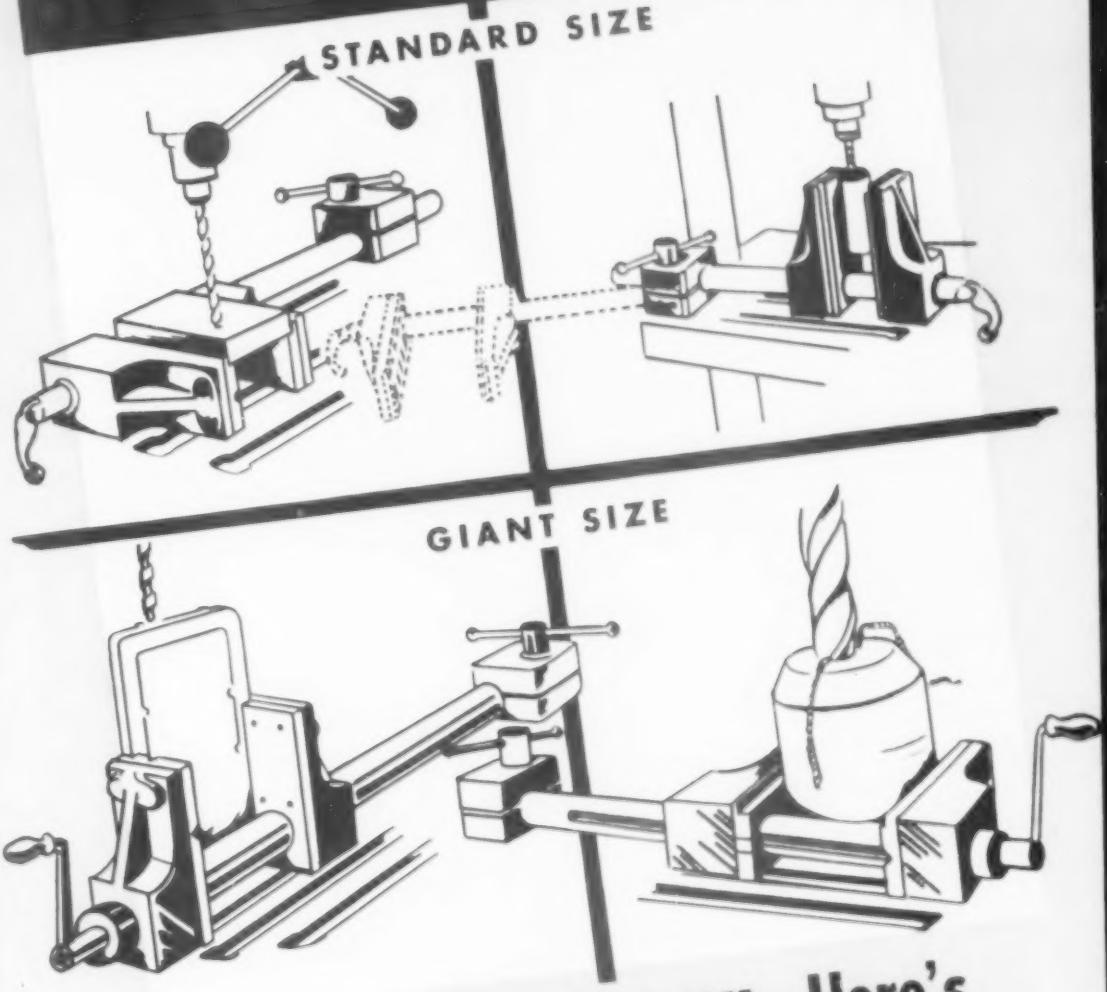
Can you spend 10 minutes with a FLOAT-LOCK* distributor ?

*patented safety drill-press vise



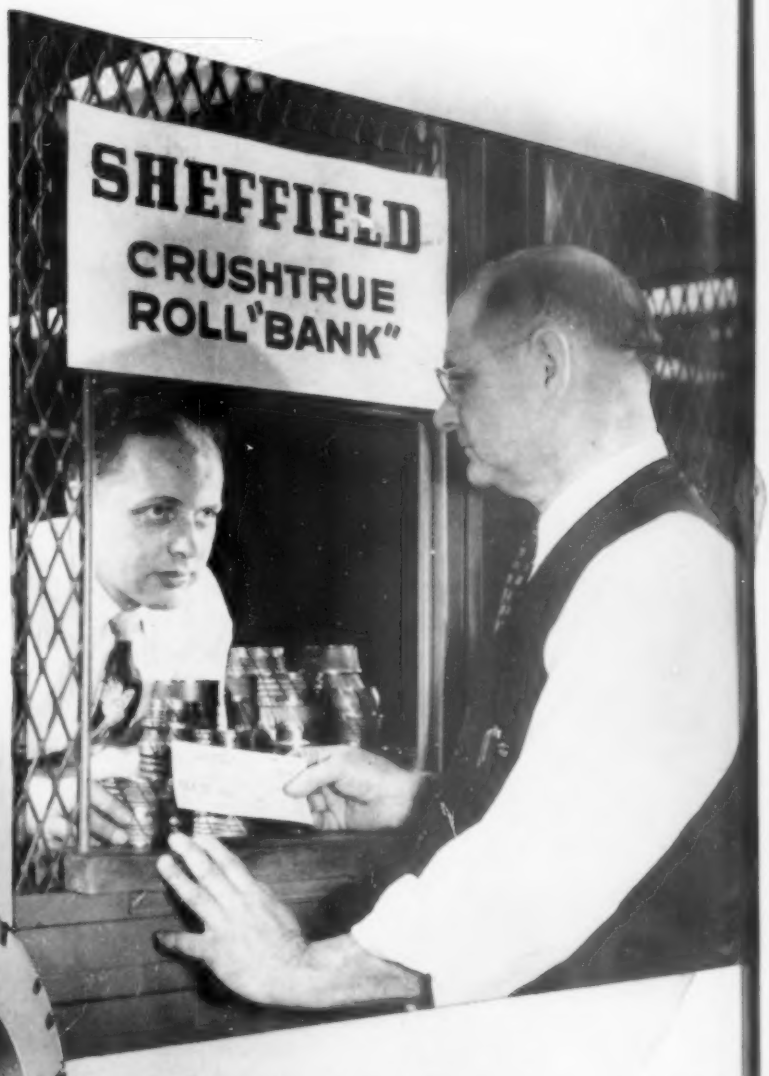
10 minutes with FLOAT-LOCK • Here's what you'll find!

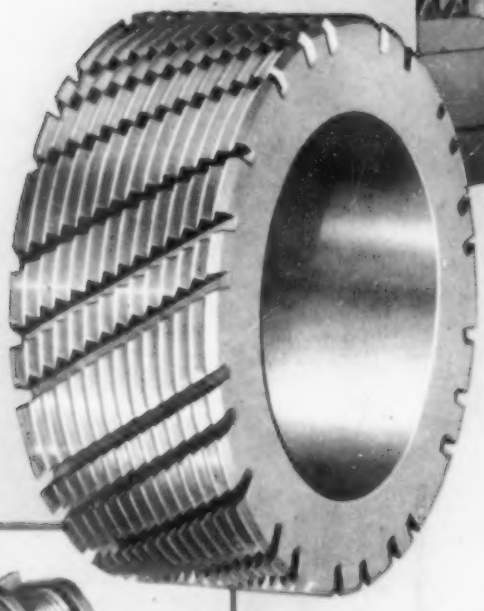
- A full-floating drill press vise—for all set-ups. Locks securely by handscrew.
- A dependable drill-jig for duplicate drilling.
- Fits all drill presses. Is readily swung clear of table when not needed.
- Promotes highest degree of Safety. Reduces drill damage.
- Standard Size 8" capacity—for all bench and column drill presses—costs only $24.00.
  Giant Size, 30" capacity, for all radials, priced at $300.
  Prices: F.O.B. factory.

Float-Lock Corporation, Bloomfield, N. J.

Sheffield Bank

offers you important savings on thread and form grinding





"Withdrawals without waiting—and at a cost of little more than handling charge."

That's the Sheffield Crushtrue Roll Bank service on rolls for crush-dressing grinding wheels for threaded and other profiled work.

Crushtrue Rolls for any standard U.S. thread form 8 to 32 pitch are always "on deposit" awaiting your "withdrawal". Identical service can be arranged for any special thread or other profile.

Only once do you pay the full price for any NEW specific roll. Thereafter, merely return your roll requiring regrinding, a replacement will be shipped usually within 24 hours at a nominal price much lower than the cost of a new roll. This can go on indefinitely, as long as the "depositor" desires.

To enjoy savings and dividends by "opening an account" at Sheffield, let us know of your requirements. Call, wire or write for data on cylindrical and surface Crushtrue grinding equipment.

MASTER CRAFTSMEN SHEFFIELD HEADQUARTERS

the *Sheffield* **corporation**

Dayton 1, Ohio, U. S. A.

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